PROGRESS

in Arithmetic

GRADE 6

SISTER M. PAULITA CAMPBELL, I.H.M.

PROGRESS

in Arithmetic

GRADE 6

SISTER M. PAULITA CAMPBELL, I. H. M.

Diocesan Supervisor of Schools, Philadelphia, Pa.

NEW YORK · WILLIAM H. SADLIER, INC. · CHICAGO

To The Teacher

Problem Analysis. One of the outstanding features of *Progress in Arithmetic* is its emphasis upon the interdependence of the three kinds of problems. These three types involve fractions, decimals, and their corresponding per cents. Situations are furnished which require the pupil to find:

1. a part of a given number
2. what part one number is of another
3. a number when a part of it is given

Method of Study. By the application of Basic Rules and their Reversals, the student is made familiar with the relations and distinctions of these three kinds of problems. As the pupil masters the relation between the Basic Rules and their Reversals, he acquires a general method of attack which leads him to use a single unified system of thinking. By this means the pupil grows mentally and is able to approach each new topic with a knowledge based upon the previous topic. Thus he avoids the memorization of a multiplicity of detached and unrelated rules and formulas.

Drills and Problems. Drill lessons progressing in range and difficulty are provided in abundance. Such exercises are a dynamic factor in promoting and engendering the habit of success which is essential to the progress of the pupil and to the solution of problems.

Individual Differences. Another important feature of this text is its provision for individual differences. While it is keyed to meet chiefly the needs of the average boy or girl, it furnishes ample work for the slow and supplies enrichment material to take care of the superior pupil.

Mental Arithmetic. Daily mental exercises are furnished. These are a sequential presentation of topics which require the pupil to think and determine the answer without pencil or paper.

Social Values. This book provides also for the social aspects of arithmetic. It introduces the pupil to business situations which are to be met in the life of the ordinary adult. It provides information about gains and losses in business transactions. It explains the saving and investing of money and the resultant benefits. It gives the pupil a knowledge of discount, commission, taxation, insurance, and other pertinent subjects which are common to everyday life.

Teaching Procedures. A Teachers's Manual and Key accompany each book in the Series. The Manual suggests methods for teaching the fundamental operations studied in arithmetic. Sample lesson plans will assist the busy teacher in preparing each day's work. A Course of Study outlines the aims, objectives, and suggested requirements for each year's program.

Copyright 1950, 1955 WILLIAM H. SADLIER, INC. Manufactured in the United States of America

Unit One: Working With Whole Numbers

1. Reading and Writing Large Numbers 3
2. Zero as a Place Holder 4
3. Place Value of Numbers 5
4. Analyzing Numbers 6
5. Working With Numbers (Arabic, Roman) 7
6. Addition and Subtraction of Whole Numbers 8-9
7. Multiplication of Whole Numbers 11-12
8. Dividing the Short Way 13
9. Division by Two Figures 14
10. Zeros in Quotient 15
11. Trial Quotient 16
12. When to Express Remainders as Fractions in Problems 17
13. Three- and Four-Place Quotients 18

Unit Two: Working With Fractions

1. Introducing Fractions 22
2. Proper Fractions, Improper Fractions, and Mixed Numbers 23
3. Addition of Fractions 24
4. Subtraction of Fractions 25
5. Mixed Numbers 26
6. Fractions With Related Denominators 27
7. Unlike Denominators With Common Factors 28
8. Denominators That Have No Common Factor 29
9. Carrying in Addition 30
10. Fractions in Subtraction 32-35
11. Fractions in Multiplication 36-38
12. Dividing Fractions 39
13. Dividing a Mixed Number by a Fraction 40
14. More Fractions in Division 41-43
15. Division Expressed as a Fraction 44
16. Complex Fractions 45-46

Unit Three: Working With Decimals

1. Decimal Fractions 50
2. Reading and Writing Decimals 51
3. Thousandths in Decimals 52
4. Ten-Thousandths in Decimals 53
5. Writing Decimals 54
6. Zeros in Decimals and Whole Numbers 55
7. Changing Decimals to Fractions 56
8. Decimals in Addition 57
9. Zeros in Decimals 58
10. Decimals in Subtraction 59-60

Unit Four: More Work With Decimals

1. Multiplying Decimals 66
2. Multiplying a Whole Number by a Decimal 67
3. Multiplying a Decimal by a Decimal 68
4. More Decimals in Multiplication 69
5. Multiplying Decimals by 10 and 100 71
6. Multiplying Decimals by 1000 72
7. Dividing a Decimal by a Whole Number 73
8. Dividing a Mixed Number by a Whole Number 74-75
9. Equalizing Decimal Places 77
10. Moving the Decimal Point 78
11. Dividing a Whole Number by a Decimal 79
12. Dividing a Decimal by a Decimal 80
13. United States Money in Decimals 82
14. Further Division With Decimals 83
15. Decimal Equivalents of Fractions 84

TABLE OF CONTENTS (Continued)

Unit Five: Working With Factors and Products

1. Comparing Numbers 90
2. Product and Factors 91–93
3. Speed Problems 94
4. The Missing Factor 95
5. More Factors and Products 96
6. Factors and Products in Problems 97
7. Cancellation 98
8. Factors 99

Unit Six: Working With Percentage

1. Percentage 102
2. Fractions With Denominators of 100 103
3. Changing Per Cents to Fractions 104
4. Per Cents Above 100 105
5. Applying Per Cents 106
6. Finding the Percentage 107–108
7. Finding Rate Per Cent 109
8. Finding the Rate 110
9. Per Cents in Discount 111
10. Finding the Rate of Discount 112
11. Finding the Net Price 113
12. Problems in Discount 114
13. Net Price and Rate of Discount 115

Unit Seven: Working With Profit, Loss, and Commission

1. Profit and Loss 118
2. Selling at a Gain 120
3. Finding the Rate 121
4. Finding the Selling Price and the Rate of Loss 122
5. Commission 124
6. Finding the Rate of Commission 125
7. Finding the Proceeds 126
8. Finding Rate When the Proceeds Are Given 127
9. Entire Cost 128
10. Summary of Rules 130

Unit Eight: Working With Measures

1. Perimeters 134
2. Areas 135
3. Measures 136
4. Compound Measures 137
5. Scale Drawings 138
6. Graphs 139

Unit Nine: Enrichment Material

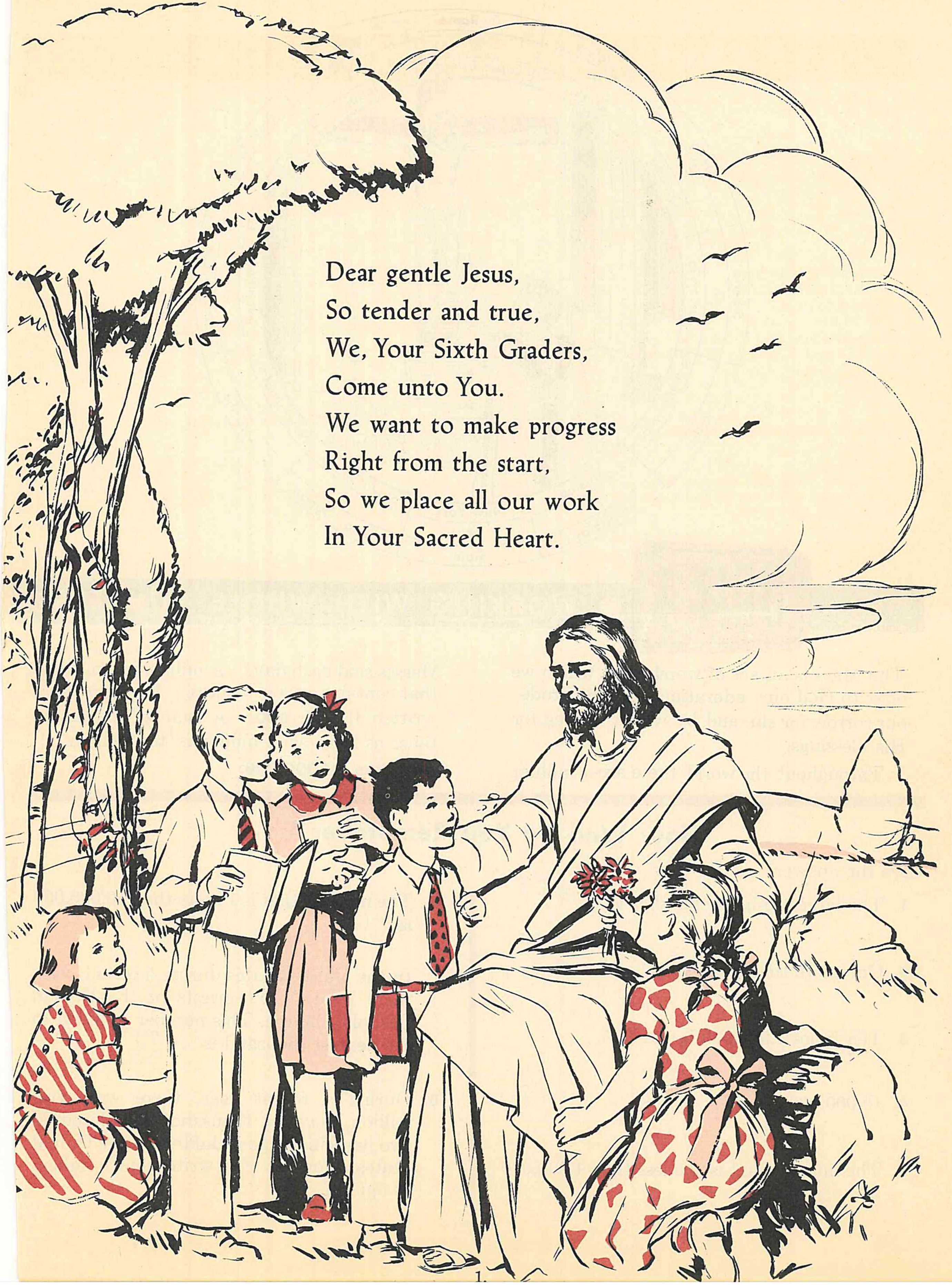
Part I: Work for Quick Thinkers

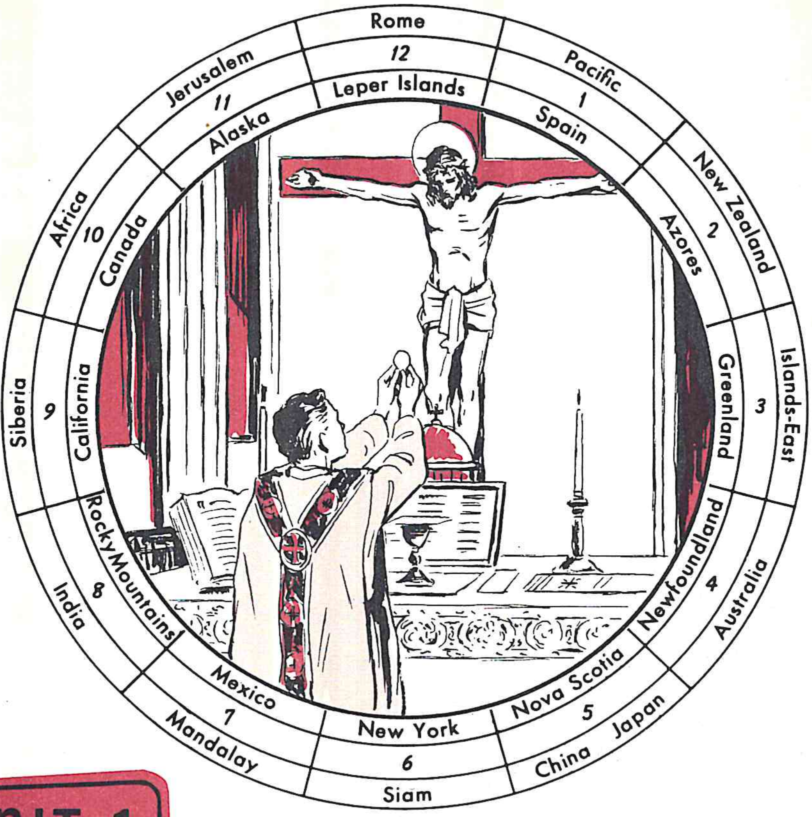
1. Finding Interest and Keeping a Budget 141
2. Sales Slips 142
3. Operations in U.S. Money 143–144
4. Estimating Answers 145

Part II: Tests 146-154
Part III: Problems for Real Thinkers 155-159

Unit Ten: Drill and Mental 160-188

Dear gentle Jesus,
So tender and true,
We, Your Sixth Graders,
Come unto You.
We want to make progress
Right from the start,
So we place all our work
In Your Sacred Heart.





UNIT 1 ● WORKING WITH WHOLE NUMBERS

The Mass is an act of worship by which we offer to God our adoration, our gratitude, our sorrow for sin, and by which we beg for His blessings.

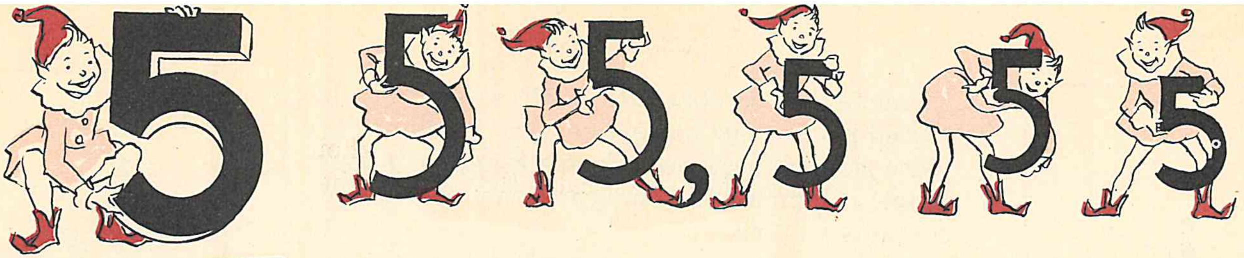
Throughout the world there are a million Masses said each day. A million is a number that contains seven figures. In figures it is written **1, 000, 000.** A number that is ten times as large as a million is ten million. It is written **10,000,000.**

How Well Do You Remember?

Give the answers orally.

1. The largest 6-figure number is ....(?).... 999999
2. One more than 999,999 is ....(?).... 1,000,000
3. Ten times 1,000,000 is ....(?).... 10,000 000
4. 10,000,000 is read ....(?).... 10 million
5. The number that is one less than 1,000,000 is ....(?).... 999,999
6. The number that is 1 more than 10,000,000 is ....(?).... 10,000,001
7. In the United States during a recent year, there were 45,459 priests of the Roman Catholic Church. This number rounded to the nearest thousand is ....(?).... 45,000
8. During a recent year, there were two million, seventy thousand, two hundred two parochial school children in the United States. How do you write this number in figures?

2,070, 200



LESSON 1.

Reading and Writing Large Numbers

To read and write large numbers, we must know:

1. How to divide a number into periods.
2. The name of each period.
3. That each period takes its name from the lowest place in the period.
4. That the last period to the left may contain **1**, **2**, or **3** figures, but that the other periods must always contain **3** figures, as **35,427,651**.

The largest **6**-place number is **999,999**

1,000,000 follows **999,999**

1,000,001 follows **1,000,000**

10,000,000 follows **9,999,999**

hundred-millions	ten-millions	millions	hundred-thousands	ten-thousands	thousands	hundreds	tens	units
1	6	3,	4	5	8,	9	2	7
3rd period millions			2nd period thousands			1st period units		

In reading a number such as **163,458,927,** begin at the left and read the number in each period as if it is standing alone. Then follow it by the name of the period:

163 (number) million (name of period)
458 (number) thousand (name of period)
927 (number) units (name of period) but we usually omit the word "units." The number is read "**163** million, **458** thousand, **927.**"

Read the following numbers:

1. 18,264,275
2. 64,518,807
3. 81,629,543
4. 92,582,671
5. 16,927,486
6. 27,804,935
7. 35,720,806
8. 40,906,320
9. 50,840,603
10. 75,304,890
11. 139,604,809
12. 467,049,380
13. 720,160,509
14. 368,009,430
15. 246,280,075
16. 134,075,206
17. 190,060,020
18. 482,005,630
19. 438,516,090
20. 624,025,125

Give the answers orally.

1. The largest 3-place number is ......(?)...... 999
2. The number that follows 999 is ......(?)...... 1000
3. The largest 4-place number is ......(?)...... 9999
4. One more than 9,999 is ......(?)...... 10,000
5. One less than 10,000 is ......(?)...... 9999
6. The largest 6-place number is ......(?)...... 999999
7. The smallest 7-place number is 1 more than ......(?)...... 999,999
8. Ten more than 99,980 is ......(?)...... 99,990
9. Ninety more than 99,910 is ......(?)...... 100,000
10. Thirty more than 999,970 is ......(?)...... 1,000,000

hundreds	tens	units
4		7
4	0	7

To make this number read **"407"**, a zero must be placed in the tens' place. The zero is said to be a place holder, because it keeps **4** and **7** in their proper columns, and it indicates that the number contains no tens.

To make this number read **"20,060"**, a zero must be placed in the thousands' place, one in the hundreds' place, and one in the units' place. These zeros hold **2** and **6** in their proper places, and they indicate that the number contains no thousands, no hundreds, and no units.

ten-thousands	thousands	hundreds	tens	units
2			6	
2	0,	0	6	0

LESSON 2.

Zero as a Place Holder

Write the number that contains:

1. 5 in the ten-thousands' place, 4 in the units' place, and zeros in the other places. Then read the number.

50,004

2. 8 in the hundred-thousands' place, 6 in the tens' place, and zeros in the other places. Then read the number.

800,060

3. 9 in the millions' place, 7 in the ten-thousands' place, 3 in the units' place, and zeros in the other places. Then read the number.

9,070,003

4. 6 in the millions' place, 4 in the hundreds' place, and zeros in the other places. Then read the number.

6,000,400

5. 7 in the millions' place, 7 in the thousands' place, 7 in the tens' place, and zeros in the other places. Then read the number.

7,007,070

6. 3 in the ten-millions' place, 3 in the hundred-thousands' place, and zeros in the other places. Then read the number.

30,300,000

Write each of the following in figures:

6,006,060

1. Six million, six thousand, sixty.
2. Nine million, forty thousand, nine.

9,040,009

3. Eight million, eight thousand, eight.

8,008,008

4. Five million, ninety thousand, thirty.

5,090,030

5. Forty million, forty thousand, four.

40,040,004

6. Seventy million, seven hundred thousand.

70,700,000

7. Twenty million, two hundred thousand, two.

20,200,002

8. Ninety million, four thousand, eighty.

90,004,080

9. Ten million, three hundred thousand, one.

10,300,001

10. Thirty million, six hundred thousand.

30,600,000

11. Fifty million, fifty thousand, fifty.

50,050,050

12. Forty million, five thousand, four.

40,005,004

13. Sixty million, nine hundred thousand.

60,900,000

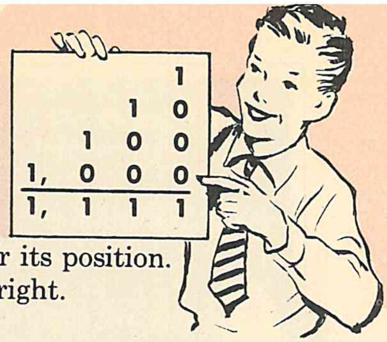
14. Eighty million, three thousand, fifty.

80,003,050

The symbol **1** written in units' place means **1** unit.
The symbol **1** written in tens' place means **1** ten.
The symbol **1** written in hundreds' place means **1** hundred.
The symbol **1** written in thousands' place means **1** thousand.

In the number **1,111**,

the value of each **1** depends upon its *place* or its position.
Each **1** is **10** times the value of the **1** to its right.
Each **1** is $\frac{1}{10}$ of the value of the **1** to its left.



LESSON 3.

Place Value of Numbers

Study this chart:

Notice that: Each place is **10** times greater than the place to the right of it. Each place is $\frac{1}{10}$ of the value of the place to the left of it.

millions **1,000,000** is **10 × 100,000**	hundred-thousands **100,000** is **10 × 10,000**	ten-thousands **10,000** is **10 × 1,000**	thousands **1,000** is **10 × 100**	hundreds **100** is **10 × 10**	tens **10** is **10 × 1**	units **1** is **10 ×** $\frac{1}{10}$
1,000,000 is $\frac{1}{10}$ of **10,000,000**	**100,000** is $\frac{1}{10}$ of **1,000,000**	**10,000** is $\frac{1}{10}$ of **100,000**	**1,000** is $\frac{1}{10}$ of **10,000**	**100** is $\frac{1}{10}$ of **1,000**	**10** is $\frac{1}{10}$ of **100**	**1** is $\frac{1}{10}$ of **10**

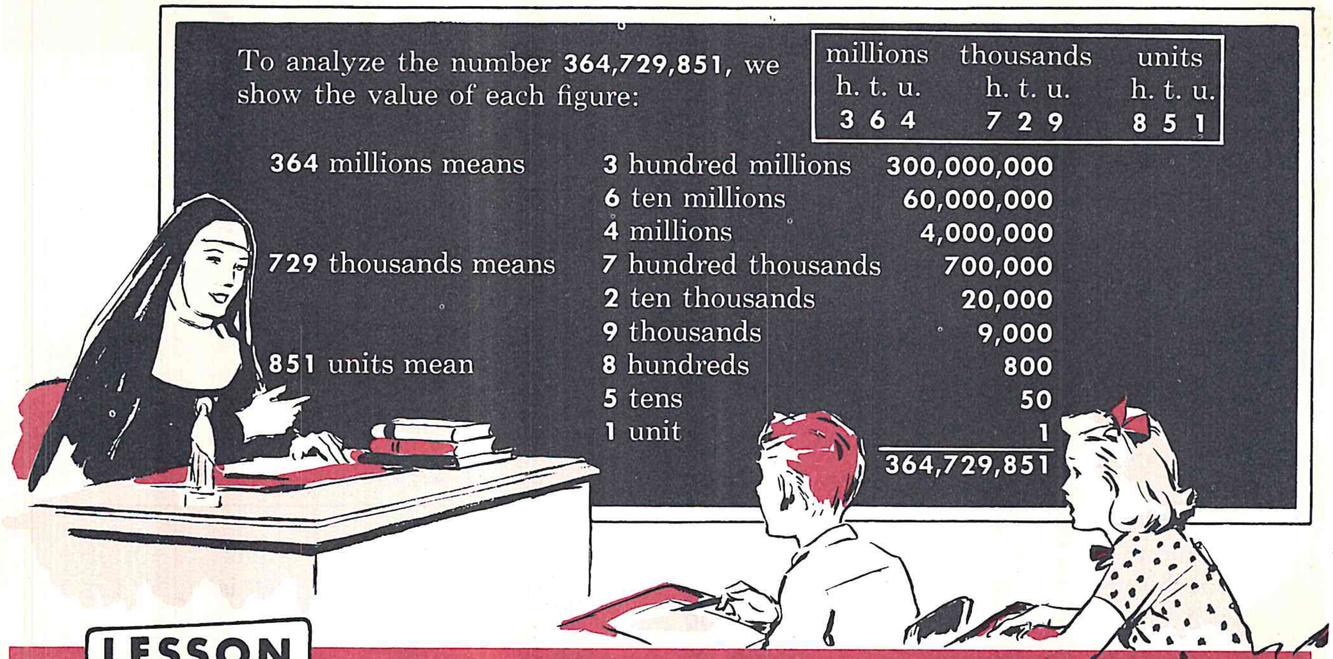
Give the answers orally.

1. The tens' place is (?) times the units'. 10
2. The hundreds' place is (?) times the tens'. 10
3. The thousands' place is (?) times the tens'. 100
4. The hundred-thousands' place is (?) times the units'. 100,000
5. The hundred-thousands' place is (?) times the tens'. 10,000
6. The ten-thousands' place is (?) times the units'. 10,000
7. The ten-thousands' place is (?) times the tens'. 1000
8. The ten-thousands' place is (?) times the hundreds'. 100
9. The ten-thousands' place is (?) times the thousands'. 10
10. The millions' place is (?) times the units'. 1,000,000
11. The millions' place is (?) times the tens'. 100,000
12. The millions' place is (?) times the hundreds'. 10,000
13. The millions' place is (?) times the thousands'. 1,000
14. The millions' place is (?) times the hundred-thousands'. 10
15. The millions' place is (?) times the ten-thousands. 100
16. The tens' place is $\frac{1}{10}$ of the (?) place. 100
17. The thousands' place is $\frac{1}{10}$ of the (?) place. 10,000
18. The hundred-thousands' place is $\frac{1}{10}$ of the (?) place. 1,000,000
19. In the number 63,245,798, what is the place value of

5 (?) thousands		2 (?) hundred thousand	
9 (?) tens		8 (?) units	
3 (?) million		4 (?) ten thousand	
7 (?) hundreds		6 (?) ten millions	

20. Study the number below and answer "True" or "False" after each statement.
13,507,498,
3 means 3 ten-millions. f
9 means 9 tens. T
5 means 5 hundred-thousands. T
8 means 8 units. T
0 means no thousands. f
4 means 4 hundreds. T
1 means 1 ten-millions. T
7 means 7 ten-thousands. f

100×100 = 10,000
1000×1000 = 1,000,000



To analyze the number **364,729,851**, we show the value of each figure:

millions	thousands	units
h. t. u.	h. t. u.	h. t. u.
3 6 4	7 2 9	8 5 1

364 millions means	**3** hundred millions	**300,000,000**
	6 ten millions	**60,000,000**
	4 millions	**4,000,000**
729 thousands means	**7** hundred thousands	**700,000**
	2 ten thousands	**20,000**
	9 thousands	**9,000**
851 units mean	**8** hundreds	**800**
	5 tens	**50**
	1 unit	**1**
		364,729,851

LESSON 4.

Analyzing Numbers

A number that contains **10** figures belongs to the billion period. One billion is **10** times a hundred million. In figures one billion is written **1,000,000,000**. Three billion in figures is **3,000,000,000**. The number **4,360,245,718** means **4** billion, **360** million, **245** thousand, **718**.

Read and analyze each as shown above:

1. 756,319,248

2. 924,319,248

3. 439,268,157

4. 628,451,379

5. 835,129,647

6. 718,364,592

7. 496,817,523

8. 951,962,438

9. 547,329,816

10. 612,943,728

Write in words:

11. 3,420,654,189

12. 9,835,476,201

13. 8,540,609,070

14. 7,045,080,620

15. 2,060,070,050

16. 4,004,004,004

17. 6,006,006,006

18. 5,050,050,050

19. 8,304,520,061

20. 4,065,304,970

Write in figures:

1. 3 billion, 145 million, 324 thousand, 40.
3,145,324,040

2. 8 billion, 63 million, 104 thousand, 82.
8,063,104,082

3. 7 billion, 4 million, 8 thousand, 609.
7,004,008,609

4. 9 billion, 30 million, 6 thousand, 890.
9,030,006,890

5. 6 billion, 6 million, 60 thousand, 60.
6,006,060,060

6. Nine billion, seventy-four million, six hundred seven thousand, eight hundred fifty-nine. 9,074,607,859

7. Eight billion, six hundred million, seventy thousand, nine hundred four.
8,600,070,904

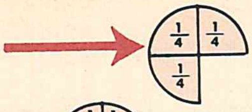
8. One billion, one million, one thousand one hundred.
1,001,001,100

9. Three billion, sixty thousand, five.
3,000,060,005

LESSON 2.

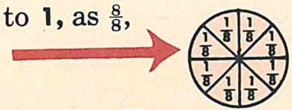
Proper Fractions, Improper Fractions, and Mixed Numbers

A *proper* fraction is one whose value is less than one, as $\frac{3}{4}$.



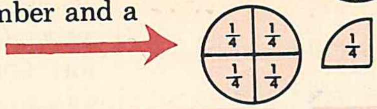
$\frac{3}{4}$ is less than **1.**

An *improper* fraction is one whose value is equal to **1**, as $\frac{8}{8}$, or whose value is greater than **1**, as $\frac{5}{4}$.



$\frac{8}{8}$ is equal to **1.**

A *mixed* number consists of a whole number and a fraction, as $1\frac{1}{4}$.



$\frac{5}{4}$ is equal to **1** whole and $\frac{1}{4}$ besides.

Improper Fraction changed to a whole number:

$\frac{8}{8} = 1$ $\quad \frac{16}{8} = 2$ $\quad \frac{7}{7} = 1$

$\frac{21}{7} = 3$

Improper Fraction changed to a mixed number:

$\frac{18}{7} = 2\frac{4}{7}$ Think: $7\overline{)18}$ **2** and **4** over. Write the remainder **4** over the denominator **7.**

Mixed Number changed to an improper fraction:

$2\frac{4}{7} = \frac{18}{7}$ Think: **7** two's are **14** and **4** are **18.** Write **18** over the denominator **7.**

List the following fractions as proper or mproper:

1. $\frac{3}{3}$ $\quad \frac{4}{3}$ $\quad \frac{5}{8}$ $\quad \frac{9}{10}$ $\quad \frac{11}{13}$ $\quad \frac{14}{7}$
2. $\frac{8}{7}$ $\quad \frac{7}{8}$ $\quad \frac{5}{6}$ $\quad \frac{6}{5}$ $\quad \frac{10}{5}$ $\quad \frac{7}{7}$
3. $\frac{9}{9}$ $\quad \frac{18}{9}$ $\quad \frac{15}{2}$ $\quad \frac{2}{15}$ $\quad \frac{7}{12}$ $\quad \frac{12}{7}$
4. $\frac{18}{19}$ $\quad \frac{23}{42}$ $\quad \frac{13}{15}$ $\quad \frac{15}{13}$ $\quad \frac{15}{15}$ $\quad \frac{30}{15}$

Change to mixed or whole numbers:

5. $\frac{15}{3}$ $\quad \frac{17}{3}$ $\quad \frac{21}{3}$ $\quad \frac{22}{3}$ $\quad \frac{9}{3}$
6. $\frac{24}{4}$ $\quad \frac{27}{4}$ $\quad \frac{32}{4}$ $\quad \frac{33}{4}$ $\quad \frac{16}{4}$
7. $\frac{35}{5}$ $\quad \frac{39}{5}$ $\quad \frac{42}{5}$ $\quad \frac{49}{5}$ $\quad \frac{25}{5}$
8. $\frac{18}{6}$ $\quad \frac{23}{6}$ $\quad \frac{29}{6}$ $\quad \frac{36}{6}$ $\quad \frac{37}{6}$
9. $\frac{28}{7}$ $\quad \frac{31}{7}$ $\quad \frac{42}{7}$ $\quad \frac{44}{7}$ $\quad \frac{53}{7}$
10. $\frac{40}{8}$ $\quad \frac{45}{8}$ $\quad \frac{17}{8}$ $\quad \frac{27}{8}$ $\quad \frac{39}{8}$
11. $\frac{27}{9}$ $\quad \frac{36}{9}$ $\quad \frac{63}{9}$ $\quad \frac{67}{9}$ $\quad \frac{73}{9}$

Change to improper fractions:

1. $3\frac{1}{3}$ $\quad 5\frac{2}{3}$ $\quad 7\frac{1}{3}$ $\quad 9\frac{2}{3}$ $\quad 4\frac{1}{3}$
2. $9\frac{1}{4}$ $\quad 7\frac{3}{4}$ $\quad 5\frac{1}{4}$ $\quad 3\frac{3}{4}$ $\quad 8\frac{1}{4}$
3. $2\frac{2}{5}$ $\quad 4\frac{3}{5}$ $\quad 6\frac{1}{5}$ $\quad 8\frac{3}{5}$ $\quad 3\frac{4}{5}$
4. $3\frac{1}{6}$ $\quad 5\frac{5}{6}$ $\quad 7\frac{1}{6}$ $\quad 9\frac{5}{6}$ $\quad 4\frac{1}{6}$
5. $4\frac{3}{7}$ $\quad 9\frac{1}{7}$ $\quad 5\frac{4}{7}$ $\quad 8\frac{5}{7}$ $\quad 6\frac{2}{7}$
6. $9\frac{1}{8}$ $\quad 7\frac{3}{8}$ $\quad 5\frac{5}{8}$ $\quad 3\frac{7}{8}$ $\quad 4\frac{1}{8}$
7. $8\frac{5}{9}$ $\quad 6\frac{7}{9}$ $\quad 4\frac{1}{9}$ $\quad 9\frac{2}{9}$ $\quad 5\frac{5}{9}$
8. $4\frac{2}{3}$ $\quad 8\frac{1}{4}$ $\quad 6\frac{3}{5}$ $\quad 3\frac{5}{6}$ $\quad 5\frac{2}{7}$
9. $6\frac{5}{9}$ $\quad 4\frac{2}{7}$ $\quad 2\frac{3}{5}$ $\quad 8\frac{1}{6}$ $\quad 5\frac{2}{3}$
10. $4\frac{1}{4}$ $\quad 6\frac{3}{5}$ $\quad 8\frac{5}{6}$ $\quad 3\frac{2}{7}$ $\quad 5\frac{7}{8}$

LESSON 3.

Addition of Fractions

Things can be added if they have the same name:

3 pencils
9 pencils
12 pencils

Fractions, too, have names. The *denominator* of a fraction tells its name. In the fraction $\frac{3}{7}$, the name of the fraction is *sevenths*.

Therefore:

Fractions can be added if they have the same denominator, as $\frac{3}{7}+\frac{2}{7}$. The denominator **7** is common to both fractions, so **7** is their *common denominator.*

3 sevenths **2** sevenths **5** sevenths	$\frac{3}{7}$ $\frac{2}{7}$ $\frac{5}{7}$	Add the numerators. Write their sum over the common denominator.

$\frac{3}{8}$ $\frac{5}{8}$ $\frac{8}{8} = 1$	$\frac{4}{9}$ $\frac{7}{9}$ $\frac{11}{9} = 1\frac{2}{9}$	$\frac{7}{12}$ $\frac{11}{12}$ $\frac{18}{12} = 1\frac{6}{12} = 1\frac{1}{2}$
The sum is an improper fraction. Change it to a whole number.	The sum is an improper fraction. Change it to a mixed number.	The sum is an improper fraction. Change it to a mixed number and reduce.

To add $\frac{2}{15}$, $\frac{7}{15}$, and $\frac{11}{15}$:

$$\frac{2}{15} \quad \frac{7}{15} \quad \frac{11}{15} \quad \frac{20}{15} = 1\frac{5}{15} = 1\frac{1}{3}$$

Add the numerators.
Write their sum over the common denominator.

Change the improper fraction in the sum to a mixed number and reduce.

Add:

1.	$\frac{5}{9}$ $\frac{2}{9}$	$\frac{2}{5}$ $\frac{1}{5}$	$\frac{5}{13}$ $\frac{1}{13}$	$\frac{4}{7}$ $\frac{2}{7}$	$\frac{3}{11}$ $\frac{7}{11}$
2.	$\frac{1}{6}$ $\frac{5}{6}$	$\frac{4}{7}$ $\frac{3}{7}$	$\frac{3}{8}$ $\frac{5}{8}$	$\frac{4}{9}$ $\frac{5}{9}$	$\frac{7}{15}$ $\frac{8}{15}$
3.	$\frac{5}{12}$ $\frac{7}{12}$	$\frac{11}{14}$ $\frac{3}{14}$	$\frac{4}{5}$ $\frac{1}{5}$	$\frac{16}{21}$ $\frac{5}{21}$	$\frac{11}{24}$ $\frac{13}{24}$
4.	$\frac{11}{12}$ $\frac{5}{12}$	$\frac{4}{15}$ $\frac{13}{15}$	$\frac{5}{9}$ $\frac{5}{9}$	$\frac{6}{7}$ $\frac{5}{7}$	$\frac{7}{8}$ $\frac{3}{8}$
5.	$\frac{5}{18}$ $\frac{17}{18}$ $\frac{22}{18}$ $1\frac{4}{18}$	$\frac{4}{21}$ $\frac{20}{21}$ $\frac{24}{21}$	$\frac{3}{14}$ $\frac{13}{14}$ $\frac{16}{14}$ $1\frac{2}{14}$	$\frac{9}{16}$ $\frac{15}{16}$	$\frac{7}{24}$ $\frac{19}{24}$ $\frac{26}{24}$ $1\frac{2}{24}$

Add:

1.	$\frac{1}{12}$ $\frac{7}{12}$ $\frac{7}{12}$	$\frac{5}{24}$ $\frac{7}{24}$ $\frac{13}{24}$	$\frac{1}{15}$ $\frac{4}{15}$ $\frac{13}{15}$	$\frac{3}{20}$ $\frac{7}{20}$ $\frac{13}{20}$
2.	$\frac{4}{21}$ $\frac{13}{21}$ $\frac{5}{21}$	$\frac{1}{18}$ $\frac{7}{18}$ $\frac{13}{18}$	$\frac{3}{16}$ $\frac{5}{16}$ $\frac{11}{16}$	$\frac{5}{28}$ $\frac{15}{28}$ $\frac{11}{28}$

Copy the following examples and add:

1. $\frac{1}{24}+\frac{5}{24}+\frac{7}{24}+\frac{13}{24}=$ ....?........

2. $\frac{2}{25}+\frac{8}{25}+\frac{7}{25}+\frac{13}{25}=$ ....?........

3. $\frac{11}{42}+\frac{13}{42}+\frac{17}{42}+\frac{5}{42}=$ ....?........

4. $\frac{8}{15}+\frac{13}{15}+\frac{14}{15}+\frac{2}{15}=$ ....?........

LESSON 4.

Subtraction of Fractions

Things that have the same name can be subtracted.

$$\begin{array}{rl} 9 & \text{marbles} \\ -3 & \text{marbles} \\ \hline 6 & \text{marbles} \end{array} \qquad \begin{array}{rl} 8 & \text{ninths} \\ -7 & \text{ninths} \\ \hline 1 & \text{ninth} \end{array}$$

Fractions that have the same denominator (name) can be subtracted.

$$\begin{array}{r} \frac{8}{9} \\ -\frac{7}{9} \\ \hline \frac{1}{9} \end{array}$$

Subtract the numerators
Write the difference over
the common denominator

$$\begin{array}{r} \frac{7}{8} \\ -\frac{3}{8} \\ \hline \frac{4}{8} = \frac{1}{2} \end{array} \qquad \begin{array}{r} \frac{5}{7} \\ -\frac{5}{7} \\ \hline 0 \end{array}$$

Subtract:

1.	$\begin{array}{r}\frac{5}{6}\\\frac{1}{6}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{8}\\\frac{3}{8}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{8}\\\frac{1}{8}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{4}\\\frac{1}{4}\\\hline\end{array}$	$\begin{array}{r}\frac{4}{5}\\\frac{2}{5}\\\hline\end{array}$
2.	$\begin{array}{r}\frac{7}{9}\\\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\\frac{1}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{6}{7}\\\frac{2}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{4}{7}\\\frac{1}{7}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{7}\\\frac{1}{7}\\\hline\end{array}$
3.	$\begin{array}{r}\frac{5}{8}\\\frac{1}{8}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{9}\\\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{9}\\\frac{4}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{2}{3}\\\frac{1}{3}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{8}\\\frac{5}{8}\\\hline\end{array}$
4.	$\begin{array}{r}\frac{11}{12}\\\frac{5}{12}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{14}\\\frac{1}{14}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{15}\\\frac{2}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{3}{20}\\\frac{1}{20}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{24}\\\frac{5}{24}\\\hline\end{array}$
5.	$\begin{array}{r}\frac{9}{10}\\\frac{9}{10}\\\hline\end{array}$	$\begin{array}{r}\frac{13}{21}\\\frac{13}{21}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{15}\\\frac{8}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{11}\\\frac{9}{11}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{9}\\\frac{8}{9}\\\hline\end{array}$
6.	$\begin{array}{r}\frac{13}{18}\\\frac{13}{18}\\\hline\end{array}$	$\begin{array}{r}\frac{6}{35}\\\frac{6}{35}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{20}\\\frac{7}{20}\\\hline\end{array}$	$\begin{array}{r}\frac{20}{63}\\\frac{20}{63}\\\hline\end{array}$	$\begin{array}{r}\frac{5}{12}\\\frac{5}{12}\\\hline\end{array}$
7.	$\begin{array}{r}\frac{8}{9}\\\frac{2}{9}\\\hline\end{array}$	$\begin{array}{r}\frac{8}{21}\\\frac{5}{21}\\\hline\end{array}$	$\begin{array}{r}\frac{7}{23}\\\frac{7}{23}\\\hline\end{array}$	$\begin{array}{r}\frac{14}{15}\\\frac{11}{15}\\\hline\end{array}$	$\begin{array}{r}\frac{9}{11}\\\frac{2}{11}\\\hline\end{array}$

Solve:

1. How much less than $\frac{5}{7}$ is $\frac{2}{7}$?

2. How much less than $\frac{5}{9}$ is $\frac{1}{9}$?

3. What is the difference between $\frac{11}{12}$ and $\frac{5}{12}$?

4. How much larger than $\frac{3}{8}$ of a pie is $\frac{5}{8}$ of the same pie?

5. How much smaller than $\frac{9}{16}$ of a pound is $\frac{5}{16}$ of a pound?

6. What is the sum of $\frac{7}{15}$ and $\frac{11}{15}$?

7. From the sum of $\frac{7}{10}$ and $\frac{3}{10}$ take $\frac{9}{10}$.

8. To the difference between $\frac{7}{12}$ and $\frac{5}{12}$ add $\frac{1}{6}$.

9. How much more than $\frac{11}{15}$ is the sum of $\frac{8}{15}$ and $\frac{7}{15}$?

10. Find the difference between $\frac{7}{20}$ and $\frac{19}{20}$.

11. What fraction is $\frac{7}{16}$ more than $\frac{5}{16}$?

12. What fraction is $\frac{5}{9}$ increased by $\frac{2}{9}$?

LESSON 5.

Mixed Numbers

Add $3\frac{1}{5}$ and $2\frac{3}{5}$. $3\frac{1}{5}$ $\underline{2\frac{3}{5}}$ $5\frac{4}{5}$	Add $6\frac{4}{15}$ and $3\frac{2}{15}$. $6\frac{4}{15}$ $\underline{3\frac{2}{15}}$ $9\frac{6}{15} = 9\frac{2}{5}$

Add the fractions.
Add the whole numbers.
Reduce the fraction in the sum or difference to lowest terms.

Add:

1.	$4\frac{1}{7}$ $\underline{5\frac{3}{7}}$	$8\frac{1}{5}$ $\underline{7\frac{2}{5}}$	$9\frac{5}{9}$ $\underline{3\frac{2}{9}}$	$7\frac{4}{11}$ $\underline{5\frac{3}{11}}$
2.	$6\frac{3}{8}$ $\underline{4\frac{1}{8}}$	$9\frac{1}{6}$ $\underline{4\frac{1}{6}}$	$10\frac{5}{12}$ $\underline{11\frac{1}{12}}$	$12\frac{1}{4}$ $\underline{15\frac{1}{4}}$
3.	$20\frac{4}{15}$ $\underline{23\frac{2}{15}}$	$30\frac{3}{16}$ $\underline{10\frac{1}{16}}$	$45\frac{5}{18}$ $\underline{15\frac{1}{18}}$	$10\frac{3}{20}$ $\underline{12\frac{7}{20}}$
4.	$18\frac{1}{8}$ $\underline{36\frac{5}{8}}$	$25\frac{5}{42}$ $\underline{15\frac{13}{42}}$	$20\frac{13}{35}$ $\underline{14\frac{8}{35}}$	$13\frac{1}{10}$ $\underline{42\frac{3}{10}}$

5. $23\frac{3}{5} + 47\frac{1}{5} = ?$ $\quad 38\frac{1}{10} + 23\frac{3}{10} = ?$

6. $47\frac{3}{8} + 63\frac{1}{8} = ?$ $\quad 75\frac{2}{9} + 81\frac{4}{9} = ?$

7. $84\frac{5}{12} + 13\frac{1}{12} = ?$ $\quad 95\frac{7}{30} + 7\frac{1}{30} = ?$

8. $29\frac{7}{13} + 3\frac{5}{13} = ?$ $\quad 56\frac{11}{40} + 37\frac{9}{40} = ?$

9. $51\frac{3}{25} + 7\frac{7}{25} = ?$ $\quad 79\frac{3}{35} + 9\frac{2}{35} = ?$

10. $25\frac{3}{10} + 6\frac{1}{10} = ?$ $\quad 63\frac{4}{17} + 8\frac{3}{17} = ?$

Take $2\frac{5}{9}$ from $6\frac{7}{9}$. $6\frac{7}{9}$ $\underline{-2\frac{5}{9}}$ $4\frac{2}{9}$	From $5\frac{7}{15}$ take $3\frac{4}{15}$. $5\frac{7}{15}$ $\underline{-3\frac{4}{15}}$ $2\frac{3}{15} = 2\frac{1}{5}$

Subtract the fractions.
Subtract the whole numbers.

Subtract:

1.	$8\frac{5}{9}$ $\underline{2\frac{4}{9}}$	$6\frac{4}{7}$ $\underline{3\frac{1}{7}}$	$7\frac{7}{15}$ $\underline{5\frac{2}{15}}$	$9\frac{4}{5}$ $\underline{7\frac{2}{5}}$
2.	$12\frac{7}{9}$ $\underline{10\frac{4}{9}}$	$18\frac{11}{20}$ $\underline{5\frac{3}{20}}$	$46\frac{15}{32}$ $\underline{17\frac{7}{32}}$	$55\frac{11}{14}$ $\underline{38\frac{3}{14}}$
3.	$20\frac{17}{33}$ $\underline{9\frac{5}{33}}$	$67\frac{13}{40}$ $\underline{10\frac{3}{40}}$	$84\frac{17}{45}$ $\underline{12\frac{2}{45}}$	$97\frac{13}{16}$ $\underline{33\frac{9}{16}}$
4.	$78\frac{10}{13}$ $\underline{25\frac{3}{13}}$	$83\frac{7}{18}$ $\underline{30\frac{5}{18}}$	$43\frac{9}{16}$ $\underline{12\frac{7}{16}}$	$57\frac{5}{12}$ $\underline{23\frac{1}{12}}$

5. $84\frac{4}{5} - 10\frac{3}{5} = ?$ $\quad 76\frac{8}{9} - 9\frac{7}{9} = ?$

6. $35\frac{4}{15} - 25\frac{1}{15} = ?$ $\quad 93\frac{13}{20} - 13\frac{3}{20} = ?$

7. $55\frac{11}{32} - 40\frac{3}{32} = ?$ $\quad 27\frac{5}{8} - 7\frac{3}{8} = ?$

8. $62\frac{20}{31} - 45\frac{10}{31} = ?$ $\quad 49\frac{11}{18} - 9\frac{5}{18} = ?$

9. $34\frac{5}{11} - 14\frac{2}{11} = ?$ $\quad 69\frac{3}{20} - 38\frac{1}{20} = ?$

10. $38\frac{12}{35} - 16\frac{3}{35} = ?$ $\quad 81\frac{6}{7} - 19\frac{3}{7} = ?$

LESSON 6.

Fractions With Related Denominators

1 WHOLE							
$\frac{1}{2}$				$\frac{1}{2}$			
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

1 WHOLE																	
$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$		$\frac{1}{9}$	
$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{18}$

dd $\frac{1}{2}$ and $\frac{3}{8}$.

he above chart shows:

$$\begin{array}{r} \frac{1}{2}=\frac{4}{8} \\ \underline{\frac{3}{8}=\frac{3}{8}} \\ \frac{7}{8} \end{array}$$

From $\frac{2}{9}$ take $\frac{1}{18}$.

The above chart shows:

$$\begin{array}{r} \frac{2}{9}=\frac{4}{18} \\ \underline{-\frac{1}{18}=\frac{1}{18}} \\ \frac{3}{18}=\frac{1}{6} \end{array}$$

nly fractions with a common denominator can be added or subtracted. ractions such as $\frac{3}{5}$ and $\frac{9}{20}$ have related denominators, because is contained in **20**. Therefore $\frac{3}{5}$ must be changed to **20**ths efore it can be added to $\frac{9}{20}$.

$\frac{3}{5} = \frac{}{20}$ Divide **20** by the denominator **5**.

$\frac{9}{0} = \frac{9}{20}$ Multiply the numerator **3** by **4**.

Write **12** over the common denominator **20**.

$$\begin{array}{r} \frac{3}{5} = \frac{12}{20} \\ \underline{\frac{9}{20} = \frac{9}{20}} \\ \frac{21}{20} = 1\frac{1}{20} \end{array}$$

dd:

.	$\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{4}$	$\frac{2}{3}$ $\frac{4}{6}$ $\frac{1}{6}$	$\frac{1}{3}$ $\frac{3}{9}$ $\frac{7}{9}$	$\frac{5}{6}$ $\frac{10}{12}$ $\frac{1}{12}$	$\frac{3}{4}$ $\frac{6}{8}$ $\frac{5}{8}$
2.	$\frac{1}{4}$ $\frac{4}{16}$ $\frac{3}{16}$	$\frac{5}{8}$ $\frac{15}{24}$ $\frac{7}{24}$	$\frac{2}{3}$ $\frac{8}{12}$ $\frac{5}{12}$	$\frac{2}{5}$ $\frac{6}{15}$ $\frac{4}{15}$	$\frac{4}{5}$ $\frac{20}{25}$ $\frac{7}{25}$
3.	$1\frac{1}{4}$ $\frac{2}{8}$ $3\frac{5}{8}$	$4\frac{1}{6}$ $\frac{3}{18}$ $6\frac{7}{18}$	$7\frac{1}{2}$ $\frac{2}{4}$ $9\frac{1}{4}$	$12\frac{7}{30}$ $\frac{14}{30}$ $1\frac{7}{15}$	
4.	$10\frac{1}{6}$ $\frac{4}{24}$ $15\frac{7}{24}$	$18\frac{5}{13}$ $\frac{10}{26}$ $19\frac{5}{26}$	$25\frac{1}{24}$ $\frac{2}{48}$ $40\frac{5}{48}$	$53\frac{3}{10}$ $\frac{9}{30}$ $16\frac{1}{30}$	
5.	$37\frac{1}{15}$ $\frac{3}{45}$ $26\frac{7}{45}$	$43\frac{5}{12}$ $\frac{15}{36}$ $8\frac{1}{36}$	$9\frac{2}{3}$ $\frac{10}{15}$ $53\frac{4}{15}$	$81\frac{3}{40}$ $\frac{14}{40}$ $18\frac{7}{20}$	

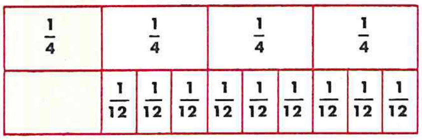
Subtract:

1.	$\frac{5}{8}$ $\frac{1}{24}$	$\frac{2}{3}$ $\frac{1}{9}$	$\frac{3}{4}$ $\frac{5}{12}$	$\frac{3}{5}$ $\frac{4}{15}$	$\frac{5}{7}$ $\frac{8}{21}$
2.	$\frac{4}{9}$ $\frac{5}{18}$	$\frac{7}{12}$ $\frac{5}{24}$	$\frac{7}{15}$ $\frac{7}{30}$	$\frac{3}{4}$ $\frac{5}{24}$	$\frac{5}{6}$ $\frac{5}{48}$
3.	$6\frac{7}{8}$ $4\frac{5}{24}$	$30\frac{5}{24}$ $15\frac{7}{48}$	$9\frac{11}{12}$ $1\frac{5}{6}$	$8\frac{7}{9}$ $3\frac{5}{18}$	
4.	$27\frac{7}{30}$ $19\frac{1}{10}$	$46\frac{7}{15}$ $38\frac{7}{45}$	$65\frac{3}{13}$ $26\frac{1}{39}$	$84\frac{1}{4}$ $17\frac{5}{48}$	
5.	$97\frac{43}{60}$ $39\frac{5}{12}$	$11\frac{5}{9}$ $6\frac{4}{27}$	$24\frac{5}{8}$ $13\frac{3}{40}$	$60\frac{3}{5}$ $44\frac{7}{20}$	

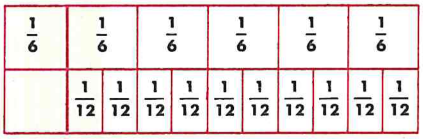
LESSON 7.

Unlike Denominators With Common Factors

Add $\frac{3}{4}$ and $\frac{5}{6}$. These fractions have unlike denominators. Before $\frac{3}{4}$ and $\frac{5}{6}$ can be added, they must be changed to the same denominator.



$$\frac{3}{4}=\frac{9}{12}$$



$$\frac{5}{6}=\frac{10}{12}$$

We see from the above chart that $\frac{3}{4}=\frac{9}{12}$ and $\frac{5}{6}=\frac{10}{12}$. Now we can add $\frac{9}{12}$ and $\frac{10}{12}$ because they have a common denominator which is **12**.

$$\begin{aligned}\frac{3}{4}&=\frac{9}{12}\\ \frac{5}{6}&=\frac{10}{12}\\ \hline &\frac{19}{12}=1\frac{7}{12}\end{aligned}$$

Fractions such as $\frac{7}{8}$ and $\frac{5}{12}$ have unlike denominators, but the denominators contai common factors. In such a case we can fin their least common denominator by findin their least common multiple.

Study the steps followed to find the L.C.M of **8** and **12**.

1. Divide by the lowest prime factor contained in both **8** and **12**. **2|8–1** **4–6**
2. Divide by the lowest prime factor contained in both **4** and **6**. **2|4–6** **2–3**
3. Multiply together divisors and the re maining numbers to find the L.C.M.

2×2×2×3 = 24 L.C.M. = **24**

A prime number is one that has no factor except itself and **1**, as **2, 3, 5, 7, 11, 13**. A composite number is one that has other factors besides itself and **1**, as **4, 6, 8, 9, 10, 12.**

$$\begin{aligned}\frac{7}{8}&=\frac{21}{24}\\ \frac{5}{12}&=\frac{10}{24}\\ \hline &\frac{31}{24}=1\frac{7}{24}\end{aligned}$$

Find the common denominator by finding the least common multiple. Then add or subtract. Watch the signs. Fractions in answers must be in the lowest terms.

1. $\frac{9}{10}+\frac{5}{12}$ $\frac{5}{6}+\frac{7}{15}$ $\frac{7}{8}-\frac{7}{20}$
2. $\frac{8}{9}-\frac{5}{6}$ $\frac{5}{8}-\frac{7}{12}$ $\frac{7}{15}+\frac{7}{9}$
3. $\frac{7}{10}-\frac{7}{15}$ $\frac{11}{15}-\frac{7}{12}$ $\frac{8}{15}+\frac{17}{20}$
4. $\frac{7}{12}-\frac{5}{18}$ $\frac{13}{27}+\frac{7}{18}$ $\frac{7}{18}-\frac{5}{24}$
5. $\frac{7}{30}+\frac{9}{20}$ $\frac{11}{18}-\frac{7}{30}$ $\frac{13}{20}-\frac{7}{12}$
6. $\frac{5}{28}-\frac{5}{42}$ $\frac{7}{24}+\frac{19}{36}$ $\frac{9}{16}-\frac{5}{24}$

$$\frac{7}{15}+\frac{1}{6}+\frac{9}{10}+\frac{4}{9}$$

When there are more than two denominators, divide by the lowest prime factor contained in at least two of them.

2|15–6–10–9
3|15–3– 5–9
5| 5–1– 5–3
1–1– 1–3

2×3×5×3 = 90
L.C.M. = **90**

1. $\frac{3}{4}+\frac{5}{6}+\frac{3}{8}$ $\frac{1}{4}+\frac{7}{8}+\frac{5}{12}+\frac{7}{16}$
2. $\frac{5}{9}+\frac{7}{12}+\frac{1}{3}$ $\frac{7}{9}+\frac{3}{4}+\frac{1}{6}+\frac{5}{18}$
3. $\frac{7}{8}+\frac{5}{12}-\frac{3}{16}$ $\frac{1}{3}+\frac{5}{6}+\frac{5}{9}+\frac{7}{12}$
4. $\frac{3}{10}+\frac{3}{4}-\frac{5}{8}$ $\frac{1}{6}+\frac{5}{18}+\frac{2}{9}+\frac{11}{12}$
5. $\frac{5}{18}+\frac{7}{9}-\frac{7}{12}$ $\frac{3}{5}+\frac{7}{20}+\frac{9}{10}-\frac{7}{15}$

LESSON 8.

Denominators That Have No Common Factor

Fractions such as $\frac{3}{5}+\frac{4}{9}$ have denominators that have no common factor. There is no number which will divide both of them without a remainder. Therefore, the common denominator is the product of their denominators. **5×9=45**

$$\begin{array}{r} \frac{3}{5}=\frac{27}{45} \\ +\frac{4}{9}=\frac{20}{45} \\ \hline \frac{47}{45}=1\frac{2}{45} \end{array} \qquad \begin{array}{r} 6\frac{6}{7}=6\frac{24}{28} \\ -2\frac{3}{4}=2\frac{21}{28} \\ \hline 4\frac{3}{28} \end{array}$$

Watch the signs:

1. $$\begin{array}{r} \frac{8}{9} \\ +\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} \frac{4}{7} \\ +\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{8} \\ +\frac{5}{7} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{4} \\ -\frac{4}{9} \\ \hline \end{array} \quad \begin{array}{r} \frac{7}{10} \\ -\frac{1}{3} \\ \hline \end{array}$$

2. $$\begin{array}{r} \frac{5}{8} \\ +\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} \frac{5}{6} \\ -\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} \frac{7}{10} \\ -\frac{4}{7} \\ \hline \end{array} \quad \begin{array}{r} \frac{2}{3} \\ -\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} \frac{10}{11} \\ +\frac{3}{4} \\ \hline \end{array}$$

3. $$\begin{array}{r} 6\frac{4}{9} \\ -2\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 5\frac{1}{3} \\ +3\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{7}{9} \\ -1\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{3}{7} \\ -2\frac{1}{5} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{6}{7} \\ -4\frac{1}{2} \\ \hline \end{array}$$

4. $$\begin{array}{r} 2\frac{1}{3} \\ +4\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{5}{9} \\ -2\frac{3}{7} \\ \hline \end{array} \quad \begin{array}{r} 5\frac{1}{6} \\ +3\frac{4}{7} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{2}{3} \\ -4\frac{1}{7} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{5}{8} \\ -6\frac{4}{7} \\ \hline \end{array}$$

5. $$\begin{array}{r} 9\frac{4}{11} \\ -2\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{4}{9} \\ -1\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{3}{5} \\ -2\frac{4}{7} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{1}{4} \\ +2\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{1}{2} \\ -2\frac{1}{3} \\ \hline \end{array}$$

6. $$\begin{array}{r} 12\frac{3}{7} \\ +5\frac{1}{9} \\ \hline \end{array} \quad \begin{array}{r} 10\frac{1}{8} \\ +7\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{1}{5} \\ +15\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 15\frac{4}{5} \\ -9\frac{1}{6} \\ \hline \end{array} \quad \begin{array}{r} 23\frac{3}{5} \\ -17\frac{2}{7} \\ \hline \end{array}$$

Solve the following:

1. Mother used $\frac{7}{8}$ of a yard of trimming for her own dress and $\frac{2}{3}$ of a yard for Alice's dress. How much trimming did she use for both dresses? +

2. Joan used $2\frac{1}{2}$ cupfuls of white sugar and $1\frac{1}{5}$ cupfuls of brown sugar to make a cake. How much sugar did she use? +

3. From a board $8\frac{2}{3}$ ft. long Bob sawed off a piece $3\frac{3}{5}$ ft. long. How many feet remained? −

4. Kathleen practiced her music lesson for $1\frac{1}{4}$ hours in the morning and $\frac{1}{3}$ hour in the afternoon. How much time did she spend practicing? +

5. John lives $\frac{5}{8}$ of a mile from school. Frank lives $\frac{3}{5}$ of a mile from school. How much farther from school does John live than Frank? −

6. The scouts walked $3\frac{1}{5}$ miles on a hiking trip on Saturday, and $2\frac{1}{4}$ miles on Sunday. Find the total number of miles they walked on the two days.

7. Jane made $9\frac{3}{4}$ lb. of candy. She kept $1\frac{1}{2}$ lb. for herself, and gave the rest to the Charity Bazaar. How much did she give to the Bazaar?

8. Patricia's aunt gave her $4\frac{2}{3}$ yards of dress material as a gift. She used only $3\frac{1}{2}$ yards for her dress. How much material had she left?

LESSON 9.

Carrying in Addition

mimeo

To change a mixed number such as $6\frac{10}{8}$ to its simplest form:

1. Change the improper fraction $\frac{10}{8}$ to a mixed number.
2. Add the whole number **6** to the result.

$$\begin{array}{r} \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4} \\ +6 \\ \hline 7\frac{1}{4} \end{array}$$

Change to simplest form:

1.	$6\frac{9}{8}$	$4\frac{12}{9}$	$3\frac{8}{6}$	$9\frac{10}{4}$	$7\frac{9}{5}$
2.	$5\frac{9}{4}$	$8\frac{10}{7}$	$7\frac{10}{6}$	$6\frac{12}{8}$	$4\frac{11}{9}$
3.	$3\frac{14}{12}$	$2\frac{20}{16}$	$5\frac{12}{10}$	$9\frac{18}{14}$	$8\frac{18}{15}$
4.	$6\frac{21}{18}$	$7\frac{28}{24}$	$4\frac{30}{25}$	$5\frac{24}{21}$	$2\frac{24}{20}$
5.	$8\frac{4}{3}$	$4\frac{3}{2}$	$9\frac{7}{6}$	$1\frac{12}{9}$	$4\frac{7}{5}$
√6.	$4\frac{10}{10}$	$8\frac{4}{4}$	$6\frac{7}{7}$	$5\frac{12}{12}$	$9\frac{8}{8}$
7.	$1\frac{15}{10}$	$4\frac{36}{32}$	$8\frac{45}{40}$	$7\frac{35}{30}$	$6\frac{40}{36}$
8.	$6\frac{20}{20}$	$8\frac{30}{20}$	$7\frac{36}{36}$	$9\frac{45}{42}$	$4\frac{25}{15}$
9.	$8\frac{20}{18}$	$9\frac{35}{25}$	$4\frac{27}{27}$	$6\frac{30}{27}$	$3\frac{45}{35}$
10.	$7\frac{12}{12}$	$5\frac{10}{7}$	$6\frac{11}{7}$	$9\frac{9}{5}$	$8\frac{30}{27}$

Add:

1.

$$\begin{array}{r} 4\frac{2}{3} \\ 2\frac{3}{4} \\ 6\frac{5}{6} \\ \hline \end{array} \qquad \begin{array}{r} 4\frac{5}{8} \\ 6\frac{3}{4} \\ 5\frac{3}{10} \\ \hline \end{array} \qquad \begin{array}{r} 2\frac{7}{18} \\ 4\frac{7}{12} \\ 6\frac{5}{9} \\ \hline \end{array} \qquad \begin{array}{r} 6\frac{7}{10} \\ 4\frac{5}{8} \\ 2\frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{r} 3\frac{5}{8} \\ 1\frac{7}{16} \\ 2\frac{7}{12} \\ \hline \end{array}$$

To add fractions such as $4\frac{5}{6}$ and $3\frac{4}{9}$

$$\begin{array}{rl|r} 4\frac{5}{6} = & 4\frac{15}{18} & \frac{23}{18} = 1\frac{5}{18} \\ 3\frac{4}{9} = & 3\frac{8}{18} & +7 \\ \hline & 7\frac{23}{18} = & 8\frac{5}{18} \end{array}$$

1. Change the improper fraction $\frac{23}{18}$ in the sum to the mixed number $1\frac{5}{18}$
2. Add this mixed number to the **7** in the sum. The answer is $8\frac{5}{18}$.

Add:

1.	$4\frac{5}{8}+3\frac{5}{6}$	$4\frac{2}{3}+6\frac{7}{8}$	$5\frac{4}{9}+2\frac{3}{5}$
2.	$3\frac{5}{7}+4\frac{1}{2}$	$6\frac{5}{9}+2\frac{5}{6}$	$8\frac{4}{7}+3\frac{2}{3}$
3.	$5\frac{7}{8}+3\frac{5}{12}$	$4\frac{11}{15}+3\frac{4}{9}$	$6\frac{13}{16}+8\frac{7}{24}$
4.	$6\frac{14}{15}+8\frac{4}{9}$	$5\frac{17}{20}+2\frac{7}{12}$	$5\frac{17}{24}+7\frac{11}{36}$
5.	$8\frac{13}{20}+1\frac{11}{16}$	$4\frac{11}{12}+6\frac{9}{20}$	$8\frac{11}{30}+4\frac{11}{12}$
6.	$5\frac{3}{4}+6\frac{5}{7}$	$8\frac{7}{8}+6\frac{1}{6}$	$5\frac{7}{10}+4\frac{5}{6}$
7.	$3\frac{11}{20}+4\frac{7}{15}$	$7\frac{5}{8}+1\frac{3}{5}$	$8\frac{4}{9}+9\frac{1}{2}$
8.	$7\frac{4}{5}+2\frac{5}{7}$	$6\frac{8}{9}+1\frac{7}{12}$	$3\frac{1}{3}+6\frac{9}{10}$
9.	$5\frac{5}{8}+7\frac{3}{4}$	$6\frac{7}{8}+9\frac{1}{2}$	$1\frac{5}{6}+9\frac{5}{12}$
10.	$2\frac{1}{2}+1\frac{4}{5}$	$3\frac{5}{6}+1\frac{1}{3}$	$6\frac{2}{3}+5\frac{3}{7}$

Add:

1. $2\frac{3}{5} + 3\frac{7}{10} + 2\frac{1}{5}$ = ...?..........
2. $12\frac{3}{4} + 8\frac{1}{6} + 5\frac{7}{12}$ = ...?..........
3. $8\frac{3}{4} + 6\frac{1}{2} + 3\frac{5}{8}$ = ...?..........

$$\begin{array}{r|r} 2\frac{5}{8} & \frac{8}{8}=1 \\ +7\frac{3}{8} & +9 \\ \hline 9\frac{8}{8}= & 10 \end{array}$$

Change the improper fraction $\frac{8}{8}$ in the sum to the whole number **1.** Add this **1** to **9** in the sum. The answer is **10.**

LESSON 10.

Practice in Addition

Add:

1. $3\frac{6}{7}+2\frac{1}{7}$ $5\frac{4}{9}+2\frac{5}{9}$ $8\frac{1}{5}+3\frac{4}{5}$
2. $6\frac{1}{8}+2\frac{7}{8}$ $4\frac{5}{6}+5\frac{1}{6}$ $2\frac{7}{12}+6\frac{5}{12}$
3. $7\frac{5}{12}+8\frac{7}{12}$ $9\frac{7}{10}+2\frac{3}{10}$ $4\frac{7}{11}+6\frac{4}{11}$
4. $9\frac{4}{13}+6\frac{9}{13}$ $5\frac{7}{15}+2\frac{8}{15}$ $9\frac{5}{14}+1\frac{9}{14}$
5. $4\frac{7}{20}+7\frac{13}{20}$ $8\frac{7}{16}+5\frac{9}{16}$ $3\frac{7}{18}+7\frac{11}{18}$
6. $9\frac{7}{8}+4\frac{5}{6}$ $4\frac{7}{15}+3\frac{7}{9}$ $2\frac{9}{10}+6\frac{7}{12}$
7. $4\frac{7}{8}+3\frac{9}{20}$ $6\frac{5}{8}+4\frac{11}{12}$ $6\frac{7}{10}+1\frac{7}{15}$
8. $7\frac{11}{15}+1\frac{17}{20}$ $4\frac{23}{27}+6\frac{7}{18}$ $9\frac{23}{30}+4\frac{19}{20}$
9. $6\frac{17}{24}+5\frac{7}{12}$ $8\frac{11}{16}+8\frac{17}{24}$ $7\frac{15}{28}+9\frac{31}{42}$
10. $2\frac{4}{5}+8\frac{7}{10}$ $3\frac{5}{9}+2\frac{4}{7}$ $6\frac{5}{7}+8\frac{5}{6}$

Add:

1.
$$\begin{array}{rrrrr} 3\frac{5}{6} & 6\frac{4}{7} & 8\frac{7}{18} & 4\frac{7}{10} & 1\frac{5}{7} \\ 2\frac{7}{12} & 2\frac{13}{14} & 4\frac{5}{9} & 9\frac{3}{4} & \frac{9}{14} \\ \underline{5\frac{11}{18}} & \underline{4\frac{11}{21}} & \underline{6\frac{7}{12}} & \underline{\frac{7}{8}} & \underline{5\frac{8}{21}} \end{array}$$

2.
$$\begin{array}{rrrrr} 9\frac{5}{12} & \frac{2}{3} & 9\frac{3}{4} & 7\frac{1}{2} & \frac{3}{4} \\ \frac{11}{16} & 4\frac{4}{5} & 5\frac{1}{3} & \frac{1}{3} & 6\frac{1}{2} \\ \underline{4\frac{7}{8}} & \underline{6\frac{1}{2}} & \underline{\frac{3}{5}} & \underline{\frac{2}{5}} & \underline{3\frac{7}{8}} \end{array}$$

Solve:

1. Joan and Jane are twins. If Joan weighs $37\frac{3}{5}$ lb. and Jane weighs $38\frac{2}{5}$ lb., what is their total weight?

2. Jim bought three chickens weighing $4\frac{1}{8}$ lb., $5\frac{3}{8}$ lb., and $6\frac{1}{2}$ lb. How many pounds of chicken did he buy altogether?

3. In the broad jump contest, Terrence jumped $5\frac{7}{8}$ ft. and Eugene jumped $1\frac{1}{8}$ ft. farther. How many feet did Eugene jump?

4. A streamlined train can go from Chicago to Denver in $15\frac{1}{4}$ hours. An airplane can make the trip in $6\frac{1}{6}$ hours. How much longer does it take the train to make the trip?

5. What is the total weight of the following loads of coal: $3\frac{1}{5}$ tons, $4\frac{1}{3}$ tons, and $2\frac{1}{10}$ tons?

6. An airplane took off in $2\frac{3}{4}$ minutes one day, and in $3\frac{2}{5}$ minutes the following day. How much faster was the first take-off?

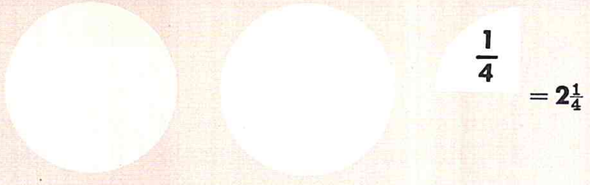
7. A steamship made three trips across the ocean. The first trip was made in $11\frac{3}{4}$ days, the second in $9\frac{1}{8}$ days, and the third in $7\frac{5}{6}$ days. What was the total number of days required for the three trips?

LESSON 10.

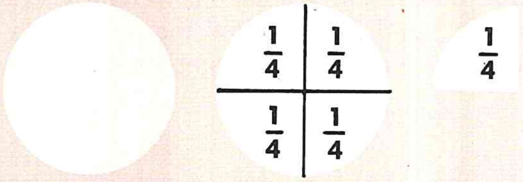
Fractions in Subtraction

Sometimes it is necessary to change a mixed number to a different form in order to borrow in subtraction.

The value of the mixed number remains the same.



Here we have **2** wholes and $\frac{1}{4}$
Change one of the wholes to $\frac{4}{4}$



Now we have **1** whole and $\frac{5}{4}$.
$2\frac{1}{4}$ has been changed to $1\frac{5}{4}$.
$2\frac{1}{4} = 1\frac{5}{4}$.

Subtract $1\frac{2}{3}$ from $4\frac{3}{8}$

$$\begin{array}{r} 4\frac{3}{8} = 4\frac{9}{24} \\ \underline{-1\frac{2}{3} = -1\frac{16}{24}} \end{array}$$

1. In order to subtract $1\frac{16}{24}$ from $4\frac{9}{24}$ we must change $4\frac{9}{24}$ to a different form.

2. Take **1** from **4**, and this will equal $\frac{24}{24}$

3. Add $\frac{24}{24}$ to $\frac{9}{24}$ and we have $\frac{33}{24}$

Now we have changed
$4\frac{9}{24}$ to the form $3\frac{33}{24}$

$$\begin{array}{r} 4\frac{3}{8} = 4\frac{9}{24} = 3\frac{33}{24} \\ \underline{-1\frac{2}{3} = 1\frac{16}{24} = 1\frac{16}{24}} \\ = 2\frac{17}{24} \end{array}$$

Change to a different form:

1. $2\frac{3}{8} = 1\frac{?}{8}$ $4\frac{1}{4} = 3\frac{?}{4}$ $4\frac{2}{3} = 3\frac{?}{3}$

2. $3\frac{4}{5} = 2\frac{?}{5}$ $8\frac{3}{4} = 7\frac{?}{4}$ $9\frac{1}{2} = 8\frac{?}{2}$

3. $6\frac{4}{9} = 5\frac{?}{9}$ $5\frac{1}{6} = 4\frac{?}{6}$ $4\frac{1}{10} = 3\frac{?}{10}$

4. $8\frac{5}{12} = 7\frac{?}{12}$ 17 $3\frac{5}{8} = 2\frac{?}{8}$ 13 $7\frac{4}{15} = 6\frac{?}{15}$

5. $9\frac{7}{16} = 8\frac{?}{16}$ $4\frac{2}{7} = 3\frac{?}{7}$ 9 $8\frac{3}{5} = 7\frac{?}{5}$ 8

6. $7\frac{1}{3} = 6\frac{?}{3}$ $8\frac{3}{20} = 7\frac{?}{20}$ $9\frac{7}{10} = 8\frac{?}{10}$

7. $5\frac{7}{18} = 4\frac{?}{18}$ $9\frac{5}{21} = 8\frac{?}{21}$ $6\frac{5}{9} = 5\frac{?}{9}$

8. $9\frac{6}{7} = 8\frac{?}{7}$ $2\frac{1}{3} = 1\frac{?}{3}$ $8\frac{5}{6} = 7\frac{?}{6}$

9. $3\frac{5}{16} = 2\frac{?}{16}$ $8\frac{3}{10} = 7\frac{?}{10}$ $5\frac{7}{12} = 4\frac{?}{12}$

10. $2\frac{9}{20} = 1\frac{?}{20}$ $5\frac{3}{25} = 4\frac{?}{25}$ $6\frac{7}{30} = 5\frac{?}{30}$

Subtract:

1. $\begin{array}{r} 6\frac{1}{6} \\ \underline{3\frac{3}{4}} \end{array}$ $\begin{array}{r} 5\frac{2}{15} \\ \underline{1\frac{4}{5}} \end{array}$ $\begin{array}{r} 10\frac{2}{3} \\ \underline{5\frac{7}{8}} \end{array}$ $\begin{array}{r} 8\frac{1}{6} \\ \underline{4\frac{5}{12}} \end{array}$

② $\begin{array}{r} 12\frac{5}{8} \\ \underline{5\frac{3}{5}} \end{array}$ $\begin{array}{r} 75\frac{1}{4} \\ \underline{10\frac{5}{16}} \end{array}$ $\begin{array}{r} 60\frac{1}{12} \\ \underline{25\frac{1}{3}} \end{array}$ $\begin{array}{r} 24\frac{1}{2} \\ \underline{19\frac{5}{8}} \end{array}$

3. $\begin{array}{r} 15\frac{7}{12} \\ \underline{8\frac{17}{24}} \end{array}$ $\begin{array}{r} 20\frac{4}{5} \\ \underline{11\frac{24}{25}} \end{array}$ $\begin{array}{r} 13\frac{1}{3} \\ \underline{7\frac{5}{9}} \end{array}$ $\begin{array}{r} 35\frac{2}{15} \\ \underline{23\frac{7}{30}} \end{array}$

4. $\begin{array}{r} 95\frac{3}{16} \\ \underline{8\frac{7}{8}} \end{array}$ $\begin{array}{r} 46\frac{1}{3} \\ \underline{22\frac{5}{6}} \end{array}$ $\begin{array}{r} 27\frac{1}{2} \\ \underline{13\frac{2}{3}} \end{array}$ $\begin{array}{r} 35\frac{1}{4} \\ \underline{24\frac{1}{2}} \end{array}$

5. $\begin{array}{r} 52\frac{2}{3} \\ \underline{21\frac{3}{4}} \end{array}$ $\begin{array}{r} 48\frac{3}{8} \\ \underline{15\frac{5}{6}} \end{array}$ $\begin{array}{r} 24\frac{1}{6} \\ \underline{10\frac{3}{4}} \end{array}$ $\begin{array}{r} 39\frac{1}{8} \\ \underline{14\frac{1}{2}} \end{array}$

A.	B.	C.	D.	E.	F.
$5 - 4\frac{2}{7}$	$1 - \frac{4}{5}$	$8\frac{3}{4} - 6\frac{3}{4}$	$4\frac{1}{2} - \frac{1}{2}$	$6\frac{3}{8} - 6$	$6 - 5\frac{3}{5}$
$\begin{array}{r} 5 = 4\frac{7}{7} \\ -4\frac{2}{7} = 4\frac{2}{7} \\ \hline \frac{5}{7} \end{array}$	$\begin{array}{r} 1 = \frac{5}{5} \\ -\frac{4}{5} \\ \hline \frac{1}{5} \end{array}$	$\begin{array}{r} 8\frac{3}{4} \\ -6\frac{3}{4} \\ \hline 2 \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ -\frac{1}{2} \\ \hline 4 \end{array}$	$\begin{array}{r} 6\frac{3}{8} \\ -6 \\ \hline \frac{3}{8} \end{array}$	$\begin{array}{r} 6 = 5\frac{5}{5} \\ -5\frac{3}{5} = 5\frac{3}{5} \\ \hline \frac{2}{5} \end{array}$

LESSON 11.

Subtraction of Fractions

Subtract:

1.	$7 - 3\frac{2}{7}$	$6 - 4\frac{1}{6}$	$9 - 7\frac{4}{9}$	$5 - 3\frac{2}{5}$
2.	$8 - 3\frac{5}{8}$	$7 - 4\frac{5}{7}$	$3 - 2\frac{1}{3}$	$4 - 3\frac{1}{4}$
3.	$7 - 5\frac{5}{7}$	$9 - 6\frac{5}{9}$	$8 - 5\frac{3}{8}$	$6 - 2\frac{5}{6}$
4.	$5 - 4\frac{1}{5}$	$4 - 2\frac{1}{4}$	$3 - 1\frac{1}{3}$	$2 - 1\frac{1}{2}$
5.	$1 - \frac{3}{5}$	$1 - \frac{4}{9}$	$1 - \frac{2}{3}$	$1 - \frac{3}{4}$
6.	$1 - \frac{5}{7}$	$1 - \frac{1}{6}$	$1 - \frac{5}{8}$	$1 - \frac{1}{2}$
7.	$1 - \frac{3}{10}$	$1 - \frac{1}{15}$	$1 - \frac{1}{24}$	$1 - \frac{1}{12}$
8.	$1 - \frac{3}{8}$	$1 - \frac{2}{5}$	$1 - \frac{5}{9}$	$1 - \frac{7}{8}$
9.	$9\frac{2}{3} - 7\frac{2}{3}$	$10\frac{5}{6} - 7\frac{5}{6}$	$7\frac{3}{4} - 4\frac{3}{4}$	$8\frac{3}{7} - 2\frac{3}{7}$

Subtract:

1.	$8\frac{3}{4} - \frac{3}{4}$	$9\frac{5}{9} - \frac{5}{9}$	$10\frac{3}{5} - \frac{3}{5}$	$7\frac{2}{3} - \frac{2}{3}$
2.	$6\frac{3}{8} - \frac{3}{8}$	$7\frac{5}{7} - \frac{5}{7}$	$5\frac{1}{5} - \frac{1}{5}$	$8\frac{3}{4} - \frac{3}{4}$
3.	$12\frac{3}{10} - \frac{3}{10}$	$10\frac{7}{8} - \frac{7}{8}$	$9\frac{5}{6} - \frac{5}{6}$	$8\frac{5}{8} - \frac{5}{8}$
4.	$10\frac{5}{8} - 10$	$8\frac{3}{4} - 8$	$6\frac{3}{5} - 6$	$8\frac{5}{6} - 8$
5.	$12\frac{3}{7} - 12$	$15\frac{4}{5} - 15$	$24\frac{3}{7} - 24$	$13\frac{2}{3} - 13$
6.	$9\frac{5}{9} - 9$	$20\frac{3}{5} - 20$	$10\frac{7}{8} - 10$	$7\frac{5}{6} - 7$
7.	$25\frac{5}{7} - 25$	$19\frac{3}{5} - 19$	$30\frac{3}{10} - 30$	$16\frac{5}{8} - 16$
8.	$4 - 3\frac{1}{2}$	$15 - 14\frac{5}{8}$	$13 - 12\frac{5}{6}$	$20 - 19\frac{7}{8}$
9.	$7 - 6\frac{3}{7}$	$10 - 9\frac{4}{5}$	$12 - 11\frac{2}{3}$	$8 - 7\frac{5}{6}$

More Fractions in Subtraction

Subtract:

1.	$\begin{array}{r} 7 \\ -2\frac{5}{12} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{3}{4} \\ -\ 8\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{2} \\ -\ \frac{1}{2} \\ \hline \end{array}$
2.	$\begin{array}{r} 5\frac{3}{7} \\ -5 \\ \hline \end{array}$	$\begin{array}{r} 25 \\ -24\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -\ 5\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{4}{9} \\ \hline \end{array}$
3.	$\begin{array}{r} 9\frac{7}{8} \\ -6\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{4} \\ -5\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{3}{5} \\ -\ \frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{5}{8} \\ -12 \\ \hline \end{array}$
4.	$\begin{array}{r} 16 \\ -15\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -5\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{6}{7} \\ \hline \end{array}$	$\begin{array}{r} 15\frac{3}{9} \\ -\ 8\frac{3}{9} \\ \hline \end{array}$
5.	$\begin{array}{r} 25\frac{1}{3} \\ -25 \\ \hline \end{array}$	$\begin{array}{r} 28 \\ -27\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} 37 \\ -25\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{5}{6} \\ \hline \end{array}$
6.	$\begin{array}{r} 15\frac{3}{8} \\ -\ 7\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 23\frac{3}{5} \\ -18\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{3}{4} \\ -12 \\ \hline \end{array}$
7.	$\begin{array}{r} 13 \\ -12\frac{5}{9} \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -5\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{7}{9} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{5}{7} \\ -6\frac{5}{7} \\ \hline \end{array}$
8.	$\begin{array}{r} 8\frac{7}{8} \\ -\ \frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 27\frac{3}{10} \\ -27 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -8\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 21 \\ -17\frac{1}{6} \\ \hline \end{array}$
9.	$\begin{array}{r} 1 \\ -\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 17\frac{7}{12} \\ -14\frac{7}{12} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{3}{4} \\ -\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 45\frac{5}{9} \\ -45 \\ \hline \end{array}$
10.	$\begin{array}{r} 32 \\ -31\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -7\frac{3}{7} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ \frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 29\frac{7}{12} \\ -21\frac{7}{12} \\ \hline \end{array}$

Solve:

1. John spent $\frac{3}{5}$ of a dollar for a knife. What fractional part of a dollar had he left?

2. If $\frac{3}{8}$ of a one-acre plot was planted in grass seed, and the rest of the plot in vegetables, what fractional part was used for vegetables?

3. Bob bought 25 yards of wire to fence his chicken yard. If he used only $17\frac{5}{8}$ yd. how much wire had he left?

4. It takes 12 flying hours to travel from New York to Omaha, and $19\frac{1}{2}$ flying hours from New York to San Francisco. How many more hours does it take to go to San Francisco than to Omaha?

5. From a roll of tape containing 10 yards, Frank used $2\frac{3}{8}$ yards to tape his baseball. How much tape was left on the roll?

6. Jane baked $8\frac{3}{4}$ dozens of cupcakes for the summer party. She sold all but $\frac{3}{4}$ of a dozen. How many dozens did she sell?

7. Bill worked 7 hours one week. The following week he worked $6\frac{3}{5}$ hours. How much longer did he work the first week?

8. Larry walks $2\frac{3}{4}$ miles to school. Jerry walks $1\frac{3}{4}$ miles. How much farther does Larry walk than Jerry?

9. Mother cut Roy's birthday cake into 16ths. She used only $\frac{11}{16}$. How many 16ths were left?

More Practice With Fractions

Watch the signs:

1. $7\frac{1}{4}+5\frac{2}{3}$ $\frac{4}{9}-\frac{1}{3}$ $1-\frac{7}{12}$

2. $9\frac{1}{3}-2\frac{2}{5}$ $\frac{5}{6}-\frac{5}{8}$ $15-14\frac{5}{8}$

3. $7\frac{5}{12}+8\frac{5}{6}$ $\frac{1}{6}+\frac{3}{4}$ $1\frac{1}{3}+\frac{5}{6}$

4. $6\frac{3}{4}+9\frac{5}{8}$ $\frac{1}{2}-\frac{4}{9}$ $\frac{7}{12}+\frac{3}{4}$

5. $5\frac{4}{9}-2\frac{4}{5}$ $\frac{7}{8}-\frac{3}{10}$ $\frac{8}{9}-\frac{5}{7}$

6. $6\frac{1}{3}-1\frac{3}{4}$ $\frac{3}{5}+\frac{4}{7}$ $\frac{7}{12}+\frac{2}{3}$

7. $9\frac{1}{2}+6\frac{6}{7}$ $\frac{4}{9}-\frac{5}{12}$ $\frac{5}{8}+\frac{7}{12}$

8. $18\frac{2}{3}+11\frac{3}{4}$ $\frac{8}{9}+\frac{3}{5}$ $9\frac{1}{2}-3$

9. $2\frac{1}{12}-1\frac{1}{9}$ $\frac{5}{6}+\frac{3}{8}$ $\frac{1}{4}-\frac{3}{16}$

10. $8\frac{5}{6}-2\frac{1}{4}$ $\frac{8}{9}-\frac{3}{4}$ $\frac{5}{9}+\frac{5}{6}$

Find the answers:

1. How much less than $3\frac{1}{8}$ is 3?

2. How much more than $\frac{5}{9}$ is $4\frac{5}{9}$?

3. From the sum of $\frac{3}{4}$ and $\frac{5}{6}$ take $\frac{7}{12}$.

4. Take $4\frac{3}{8}$ from the sum of $1\frac{3}{5}$ and $2\frac{9}{10}$.

5. What is the difference between $2\frac{5}{9}$ and 3?

6. When you take $\frac{6}{7}$ from 1, what is the remainder?

7. Take $8\frac{1}{5}$ from $10\frac{1}{5}$. From $7\frac{1}{2}$ take 7.

Study the following example:

Which fraction has the greater value $\frac{5}{8}$ or $\frac{5}{9}$?

To compare fractions change them to the same denominator.

$\frac{5}{8}=\frac{45}{72}$

$\frac{5}{9}=\frac{40}{72}$

$\frac{45}{72}$ is greater than $\frac{40}{72}$; therefore $\frac{5}{8}$ is greater than $\frac{5}{9}$.

Circle the fraction of greater value:?

1. $\frac{3}{4}$ or $\frac{4}{5}$ $\frac{2}{7}$ or $\frac{3}{10}$ $\frac{7}{9}$ or $\frac{5}{6}$

2. $\frac{4}{9}$ or $\frac{5}{12}$ $\frac{1}{8}$ or $\frac{1}{6}$ $\frac{2}{3}$ or $\frac{3}{4}$

3. $\frac{4}{5}$ or $\frac{7}{9}$ $\frac{7}{8}$ or $\frac{5}{6}$ $\frac{6}{7}$ or $\frac{7}{8}$

4. $\frac{9}{10}$ or $\frac{8}{9}$ $\frac{7}{10}$ or $\frac{7}{12}$ $\frac{11}{15}$ or $\frac{13}{20}$

5. $\frac{5}{12}$ or $\frac{7}{18}$ $\frac{4}{7}$ or $\frac{2}{3}$ $\frac{9}{20}$ or $\frac{11}{30}$

Solve the following:

1. By how much is $8\frac{5}{8}$ ft. less than 3 yd.?

2. How many inches must be added to $6\frac{5}{8}$ inches to equal 1 foot?

3. A piece of beef weighed 8 lb. Two pieces, one weighing $3\frac{1}{2}$ lb. and the other $2\frac{5}{8}$ lb., were cut from it. How many pounds were left?

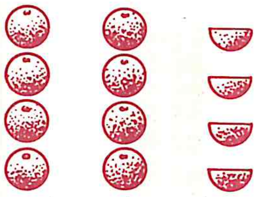
4. One piece of wood is $\frac{11}{16}$ in. thick, and another is $\frac{7}{12}$ in. thick. How much more than 1 inch is their combined thickness?

5. Maureen weighs $80\frac{1}{2}$ lb. Angela weighs $84\frac{3}{8}$ lb. Susan weighs $86\frac{3}{4}$ lb. What is their total weight?

LESSON 11.

Fractions in Multiplication

Jane allows **$2\frac{1}{2}$** oranges for each glass of orange juice that she serves. How many oranges will Jane use for **4** glassfuls of orange juice?



$2\frac{1}{2}$

$2\frac{1}{2}$

$2\frac{1}{2}$

$2\frac{1}{2}$

$\mathbf{2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2} = 8\frac{4}{2} = 10}$

We can find the answer by adding as above. We can also find the answer by multiplying as below:

$$4\times2\tfrac{1}{2}=\frac{4}{1}\times\frac{5}{2}=\frac{20}{2}=10$$

$4\times2\frac{1}{2}=10$ and $2\frac{1}{2}\times4=10$

Multiplying fractions:

1. Change mixed numbers to improper fractions $2\frac{1}{2}=\frac{5}{2}$
2. Cancel whenever possible $\frac{\overset{2}{\cancel{4}}}{1}\times\frac{5}{\underset{1}{\cancel{2}}}$
3. Multiply numerators to obtain the numerator in the product $2\times5=10$
4. Multiply denominators to obtain the denominator in the product $1\times1=1$

To cancel means to divide both a numerator and a denominator by the same number.

$$\frac{\overset{2}{\cancel{4}}}{1}\times\frac{5}{\underset{1}{\cancel{2}}}=\frac{10}{1}=10$$

We divided **4** in the numerator by **2**, and **2** in the denominator by **2**.

Multiply:

1. $10\times3\frac{1}{5}$ $2\frac{4}{9}\times12$ $5\frac{1}{8}\times10$

2. $12\times4\frac{2}{3}$ $3\frac{1}{4}\times10$ $9\times6\frac{1}{6}$

3. $14\times2\frac{4}{7}$ $5\frac{1}{6}\times12$ $4\frac{3}{4}\times10$

4. $18\times1\frac{1}{6}$ $4\frac{1}{9}\times15$ $6\frac{5}{7}\times21$

5. $24\times2\frac{3}{8}$ $8\frac{5}{7}\times14$ $3\frac{4}{5}\times15$

6. $20\times1\frac{5}{8}$ $6\frac{4}{5}\times20$ $12\times1\frac{5}{9}$

7. $16\times1\frac{5}{12}$ $3\frac{5}{12}\times8$ $30\times2\frac{7}{10}$

8. $21\times3\frac{2}{7}$ $4\frac{7}{8}\times16$ $3\frac{1}{12}\times18$

9. $27\times1\frac{5}{18}$ $3\frac{2}{9}\times21$ $5\frac{1}{9}\times24$

10. $12\times3\frac{5}{8}$ $8\frac{1}{6}\times15$ $12\times\frac{1}{16}$

Solve the following problems:

1. Tom practiced on the piano $1\frac{1}{4}$ hours each day. How many hours did he practice in 6 days?
2. The average amount of butter used in the Glenn family in a week is $4\frac{1}{2}$ pounds. At this rate, how much will they use in 8 weeks?
3. If Margaret uses $1\frac{1}{8}$ yards of ribbon to make one bow, how many yards will she use to make 12 bows?
4. The curtain rod for each window in the Garden Court Apartment House measures $2\frac{4}{5}$ ft. How many feet of curtain rod will be used for 96 windows?
5. In John's class the children study arithmetic for $4\frac{1}{2}$ hours each week. How many hours do they spend on arithmetic in 6 weeks?
6. If $2\frac{1}{2}$ yards of silk are needed to make 1 dress, how many yards will it require to make 10 dresses?

More Fractions in Multiplication

A.	B.	C.	D.
$\frac{24}{35}\times\frac{45}{56}=$ $\frac{\overset{3}{\cancel{24}}}{\underset{7}{\cancel{35}}}\times\frac{\overset{9}{\cancel{45}}}{\underset{7}{\cancel{56}}}=\frac{27}{49}$	$3\frac{3}{4}\times1\frac{1}{3}=$ $\frac{\overset{5}{\cancel{15}}}{\underset{1}{\cancel{4}}}\times\frac{\overset{1}{\cancel{4}}}{\underset{1}{\cancel{3}}}=\frac{5}{1}=5$	$\frac{2}{5}\times2\frac{1}{2}=$ $\frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{5}}}\times\frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{2}}}=\frac{1}{1}=1$	$8\frac{1}{3}\times\frac{3}{50}=$ $\frac{\overset{1}{\cancel{25}}}{\underset{1}{\cancel{3}}}\times\frac{\overset{1}{\cancel{3}}}{\underset{2}{\cancel{50}}}=\frac{1}{2}$

Multiply:

1.	$\frac{3}{8}\times\frac{4}{9}$	$\frac{7}{12}\times\frac{18}{35}$	$\frac{27}{32}\times\frac{8}{21}$
2.	$\frac{9}{28}\times\frac{14}{27}$	$\frac{16}{21}\times\frac{7}{32}$	$\frac{9}{20}\times\frac{25}{36}$
3.	$\frac{24}{35}\times\frac{45}{56}$	$\frac{15}{32}\times\frac{48}{55}$	$\frac{16}{39}\times\frac{13}{16}$
4.	$3\frac{3}{4}\times9\frac{3}{5}$	$3\frac{1}{8}\times3\frac{1}{5}$	$3\frac{5}{9}\times3\frac{3}{8}$
5.	$2\frac{2}{7}\times2\frac{5}{8}$	$5\frac{1}{3}\times2\frac{5}{8}$	$3\frac{5}{9}\times2\frac{1}{4}$
6.	$9\frac{1}{3}\times2\frac{1}{4}$	$3\frac{3}{8}\times10\frac{2}{3}$	$4\frac{1}{2}\times2\frac{1}{3}$
7.	$\frac{7}{8}\times1\frac{1}{7}$	$\frac{5}{18}\times3\frac{3}{5}$	$\frac{7}{12}\times3\frac{3}{7}$
8.	$\frac{9}{52}\times2\frac{8}{9}$	$\frac{16}{21}\times2\frac{5}{8}$	$\frac{15}{32}\times2\frac{14}{25}$
9.	$\frac{7}{9}\times3\frac{6}{7}$	$\frac{5}{12}\times6\frac{2}{5}$	$2\frac{2}{9}\times4\frac{1}{2}$
10.	$3\frac{3}{7}\times\frac{7}{48}$	$1\frac{1}{9}\times\frac{3}{50}$	$2\frac{1}{4}\times\frac{2}{27}$
11.	$1\frac{3}{7}\times\frac{7}{30}$	$6\frac{2}{3}\times\frac{1}{40}$	$1\frac{11}{15}\times\frac{5}{52}$
12.	$4\frac{2}{3}\times\frac{9}{28}$	$1\frac{1}{8}\times\frac{4}{27}$	$1\frac{7}{9}\times\frac{5}{16}$
13.	$3\frac{1}{3}\times2\frac{1}{4}$	$\frac{7}{24}\times3\frac{3}{7}$	$4\frac{4}{9}\times\frac{7}{30}$
14.	$6\frac{1}{4}\times2\frac{2}{5}$	$7\frac{1}{5}\times3\frac{1}{8}$	$4\frac{1}{6}\times\frac{1}{25}$
15.	$2\frac{2}{5}\times1\frac{7}{18}$	$\frac{5}{32}\times1\frac{3}{5}$	$5\frac{1}{7}\times2\frac{5}{8}$

When a whole number or a mixed number is multiplied by a proper fraction, the product is less than the whole or the mixed number.

Solve the following problems:

1. A recipe for making fudge calls for $2\frac{1}{3}$ cupfuls of sugar. If Madge wants to make $4\frac{1}{2}$ times the amount the recipe gives, how much sugar will she need?

2. Dick lives $\frac{7}{8}$ of a mile from school. If he walks this distance twice daily, how far will he walk in 5 days?

3. Rose can read $4\frac{1}{2}$ pages of her book in one hour. How many pages can she read in $3\frac{1}{3}$ hrs.?

4. If one turkey weighs $18\frac{1}{4}$ pounds and another weighs $1\frac{1}{2}$ times as much, what is the weight of the second turkey?

5. The scouts hiked $4\frac{3}{8}$ miles in an hour. At this rate how far could they walk in $2\frac{2}{5}$ hours?

6. Bill can earn $\frac{3}{4}$ of a dollar in an hour. How much will he earn in $3\frac{1}{3}$ hours?

7. A boat can sail $6\frac{3}{4}$ miles in one hour. How far can it sail in $2\frac{2}{3}$ hrs.?

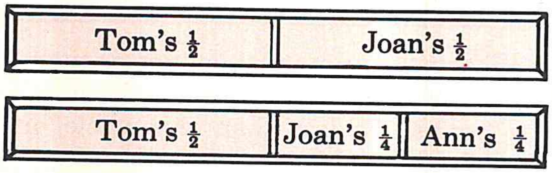
8. Margaret saves \$$18\frac{3}{4}$ a month. At this rate how much will she save in $3\frac{1}{4}$ months?

9. If Arthur earns \$$9\frac{3}{4}$ in one day, how much can he earn in $5\frac{1}{2}$ days?

More Fractions in Multiplication

Tom bought a giant chocolate bar. He gave $\frac{1}{2}$ of it to his sister, Joan. Joan gave $\frac{1}{2}$ of hers to her friend, Ann.

The illustration shows what part Joan and Ann then had.



$\frac{1}{2}$ of $\frac{1}{2}$ means $\frac{1}{2}\times\frac{1}{2}$ $\qquad$ $\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$
Joan had $\frac{1}{4}$ of a bar. $\qquad$ Ann had $\frac{1}{4}$ of a bar.

Find:

1. $\frac{3}{8}$ of 48 $\qquad$ $\frac{6}{7}$ of $2\frac{1}{3}$ $\qquad$ $\frac{7}{9}$ of $\frac{27}{28}$
2. $\frac{9}{10}$ of 100 $\qquad$ $\frac{7}{9}$ of $2\frac{1}{4}$ $\qquad$ $\frac{7}{20}$ of $\frac{15}{16}$
3. $\frac{7}{12}$ of 144 $\qquad$ $\frac{6}{25}$ of $\frac{20}{21}$ $\qquad$ $\frac{9}{16}$ of $6\frac{2}{3}$
4. $\frac{11}{24}$ of 64 $\qquad$ $\frac{5}{6}$ of $\frac{21}{20}$ $\qquad$ $\frac{7}{12}$ of $5\frac{1}{3}$

Study this example:

$$\frac{1}{3}\times2\tfrac{1}{2}\times1\tfrac{3}{5}=\frac{1}{3}\times\frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{2}}}\times\frac{\overset{4}{\cancel{8}}}{\underset{1}{\cancel{5}}}=\frac{4}{3}=1\tfrac{1}{3}$$

Multiply:

1. $\frac{5}{24}\times2\frac{2}{5}\times1\frac{1}{8}$ $\qquad$ 3. $2\frac{1}{4}\times5\frac{1}{3}\times\frac{7}{24}$
2. $2\frac{2}{9}\times\frac{18}{25}\times\frac{5}{8}$ $\qquad$ 4. $6\frac{1}{4}\times\frac{7}{15}\times5\frac{1}{7}$

Solve:

1. Mary is 48 inches tall. Betty is $\frac{7}{8}$ as tall. How tall is Betty?
2. How many inches are there in $\frac{3}{4}$ of a ft.?
3. Charles had 90 cents. He spent $\frac{3}{5}$ of it for school supplies. How much did he spend?

Study this method of multiplying togethe a whole number and a mixed number.

A.

$$\$16\tfrac{3}{4}\times24$$

$$\begin{array}{r} 24 \\ \times16\frac{3}{4} \\ \hline 18 \\ 144 \\ 24 \\ \hline 402 \end{array} \qquad \frac{3}{\underset{1}{\cancel{4}}}\times\frac{\overset{6}{\cancel{24}}}{1}=18$$

B.

$$36\times27\tfrac{3}{8}$$

$$\begin{array}{r} 27\frac{3}{8} \\ \times36 \\ \hline 13\frac{1}{2} \\ 162 \\ 81 \\ \hline 985\frac{1}{2} \end{array} \qquad \frac{\overset{9}{\cancel{36}}}{1}\times\frac{3}{\underset{2}{\cancel{8}}}=\frac{27}{2}=13\tfrac{1}{2}$$

Danger Spot:

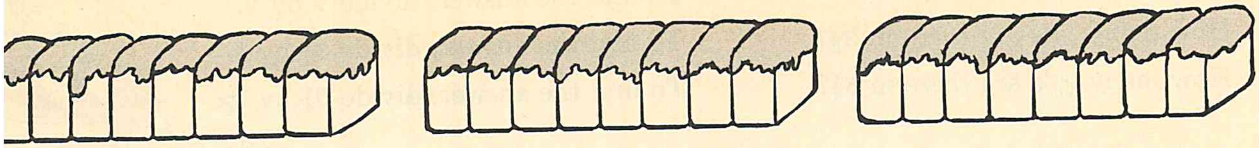
Watch where you place the first figure of each partial product.

Multiply:

1. $35\times12\frac{2}{7}$ $\qquad$ $37\frac{1}{4}\times48$ $\qquad$ $45\times18\frac{2}{9}$
2. $56\times24\frac{3}{4}$ $\qquad$ $85\frac{2}{3}\times36$ $\qquad$ $72\times20\frac{3}{8}$
3. $85\times36\frac{2}{5}$ $\qquad$ $20\frac{2}{9}\times81$ $\qquad$ $32\times15\frac{3}{4}$
4. $96\times57\frac{3}{8}$ $\qquad$ $50\frac{3}{5}\times60$ $\qquad$ $83\frac{2}{3}\times36$
5. $24\times48\frac{1}{4}$ $\qquad$ $46\frac{5}{6}\times90$ $\qquad$ $96\frac{1}{6}\times48$
6. $72\times63\frac{5}{6}$ $\qquad$ $54\frac{3}{4}\times96$ $\qquad$ $21\frac{5}{7}\times56$

Solve:

1. How far will a train go in $12\frac{1}{3}$ hours, if it averages 45 miles per hour?
2. At a speed of 320 m.p.h., how far will a plane go in $4\frac{1}{8}$ hours?
3. During last summer Paul worked $3\frac{4}{5}$ hours every day for a week of 5 days. How many hours did he work in 4 weeks?



LESSON 12.

Dividing Fractions

other bought **3** loaf cakes for Carol's party. She gave $\frac{1}{8}$ of a cake to each child at the party. ow many children was she able to serve?

n **1** whole, there are $\frac{8}{8}$
n **2** wholes, there are $\frac{16}{8}$
n **3** wholes, there are $\frac{24}{8}$

To the question, "How many eighths are there in **3?**" the answer is **24.** This means that $\frac{1}{8}$ is contained in **3**, 24 times, or $3 \div \frac{1}{8} = 24$. The dividend is **3**, the divisor is $\frac{1}{8}$, and the quotient is **24.**

When we divide a whole number by a proper fraction, the quotient is larger than the whole number in the dividend.

In division of fractions:

1. Change the sign ÷ to ×
2. Invert the divisor (The divisor always follows the division sign)
3. Follow the procedure for the multiplication of fractions.

A. $3 \div \frac{1}{8} = \frac{3}{1} \div \frac{1}{8}$

$= \frac{3}{1} \times \frac{8}{1} = \frac{24}{1} = 24$

B. $16 \div \frac{8}{9} = \frac{16}{1} \div \frac{8}{9}$

$= \frac{\overset{2}{\cancel{16}}}{1} \times \frac{9}{\underset{1}{\cancel{8}}} = \frac{18}{1} = 18$

Check
divisor × quotient
equals dividend

$\frac{1}{\underset{1}{\cancel{8}}} \times \frac{\overset{3}{\cancel{24}}}{1} = 3$

Check

$\frac{8}{\underset{1}{\cancel{9}}} \times \frac{\overset{2}{\cancel{18}}}{1} = 16$

Divide:

1. $12 \div \frac{2}{3}$ $18 \div \frac{9}{10}$ $27 \div \frac{6}{7}$ $36 \div \frac{4}{5}$
2. $32 \div \frac{8}{9}$ $49 \div \frac{7}{8}$ $24 \div \frac{3}{8}$ $42 \div \frac{6}{7}$

Study the following solutions:

If Jim can ride **9** miles on his bicycle in 2 hours, how far can he go in **1** hour?

The answer is $9 \div 2$ or $4\frac{1}{2}$ miles.

Substitute in the above problem— $1\frac{1}{2}$ hours for **2** hours—then the problem reads:

If Jim can ride **9** miles on his bicycle in $1\frac{1}{2}$ hours, how far can he go in **1** hour?

The answer is $9 \div 1\frac{1}{2}$ or $\frac{9}{1} \div \frac{3}{2}$

$= \frac{\overset{3}{\cancel{9}}}{1} \times \frac{2}{\underset{1}{\cancel{3}}} = 6$ miles

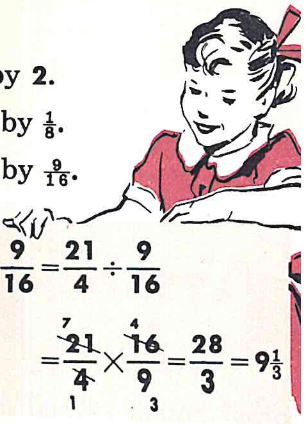
Solve the following:

1. A certain train can go 120 miles in $2\frac{1}{2}$ hr. What is its speed per hour?
2. If Bernard can read 90 words in $4\frac{1}{2}$ min., what is his reading speed per minute?
3. If Mary can make 15 bows in $7\frac{1}{2}$ min., how many can she make in 1 minute?
4. Jim's sister can type 130 words in $2\frac{1}{2}$ min. How many can she type in 1 minute?
5. If Bill can solve 15 problems in $1\frac{1}{2}$ hours, how many can he solve in 1 hour?
6. Agnes paid $4 for $2\frac{2}{3}$ yd. of silk. What was the price per yard?

How many **2**'s are there in **9**? To find the answer, divide **9** by **2**.

How many $\frac{1}{8}$'s are there in $3\frac{1}{2}$? To find the answer, divide $3\frac{1}{2}$ by $\frac{1}{8}$.

How many $\frac{9}{16}$'s are there in $5\frac{1}{4}$? To find the answer, divide $5\frac{1}{4}$ by $\frac{9}{16}$.



$$2\overline{)9}^{\,4\frac{1}{2}} \quad \text{or}$$

$$\frac{9}{1}\div\frac{2}{1}=\frac{9}{1}\times\frac{1}{2}=\frac{9}{2}=4\frac{1}{2}$$

$$3\frac{1}{2}\div\frac{1}{8}=\frac{7}{2}\div\frac{1}{8}$$

$$=\frac{7}{\underset{1}{\cancel{2}}}\times\frac{\overset{4}{\cancel{8}}}{1}=\frac{28}{1}=28$$

$$5\frac{1}{4}\div\frac{9}{16}=\frac{21}{4}\div\frac{9}{16}$$

$$=\frac{\overset{7}{\cancel{21}}}{\underset{1}{\cancel{4}}}\times\frac{\overset{4}{\cancel{16}}}{\underset{3}{\cancel{9}}}=\frac{28}{3}=9\frac{1}{3}$$

LESSON 13.

Dividing a Mixed Number by a Fraction

Divide:

1. $6\frac{1}{4}\div\frac{5}{8}$ $\quad 7\frac{1}{5}\div\frac{9}{10}$ $\quad 6\frac{3}{4}\div\frac{5}{21}$

2. $3\frac{1}{5}\div\frac{8}{9}$ $\quad 2\frac{1}{7}\div\frac{10}{11}$ $\quad 9\frac{1}{3}\div\frac{7}{12}$

3. $8\frac{1}{3}\div\frac{10}{11}$ $\quad 6\frac{3}{7}\div\frac{5}{12}$ $\quad 5\frac{5}{6}\div\frac{15}{16}$

4. $4\frac{3}{8}\div\frac{21}{22}$ $\quad 8\frac{1}{6}\div\frac{14}{15}$ $\quad 2\frac{5}{8}\div\frac{14}{15}$

5. $2\frac{1}{10}\div\frac{7}{30}$ $\quad 2\frac{1}{15}\div\frac{8}{9}$ $\quad 9\frac{1}{3}\div\frac{7}{24}$

6. $6\frac{1}{8}\div\frac{7}{8}$ $\quad 7\frac{1}{9}\div\frac{16}{17}$ $\quad 2\frac{7}{10}\div\frac{9}{25}$

Study the following examples:

If a piece of ribbon **10** yards long is cut into pieces **2** yards long, how many pieces will there be? (To find the answer, find how many **2**'s there are in **10**) $\mathbf{10\div 2=5}$ In the above problem, substitute $\mathbf{10\frac{1}{2}}$ for **10**, and $\frac{3}{4}$ for **2**. Then the problem will read:

If a piece of ribbon $\mathbf{10\frac{1}{2}}$ yards long is cut into pieces $\frac{3}{4}$ yard long, how many pieces will there be? (To find the answer, *find how many* $\frac{3}{4}$*'s there are in* $\mathbf{10\frac{1}{2}}$)

$$10\frac{1}{2}\div\frac{3}{4}=\frac{21}{2}\div\frac{3}{4}$$

$$=\frac{\overset{7}{\cancel{21}}}{\underset{1}{\cancel{2}}}\times\frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{3}}}=\mathbf{14}\text{ pieces}$$

When we divide a mixed number by a proper fraction, the quotient is larger than the dividend.

Solve the following problems: (Substitut whole numbers for the fraction if you hav difficulty, and decide the process.)

1. How many $\frac{3}{4}$'s are there in $2\frac{5}{8}$?

2. Angelo's steps are $\frac{7}{12}$ of a yard long. Hov many steps does he take in walking 8 yards?

3. A certain plane can go $5\frac{1}{3}$ miles per minute How many minutes will it take it to g 128 miles?

4. How many pieces of ribbon $\frac{3}{4}$ yd. long car be cut from $7\frac{1}{2}$ yards?

5. How many $\frac{7}{8}$ pound boxes can be fillec from $15\frac{3}{4}$ pounds of candy?

6. How many $\frac{1}{2}$ pint bottles can be filled from $14\frac{1}{2}$ pints of milk?

7. How many $\frac{3}{4}$ pound packages of tea can be made from $7\frac{1}{2}$ pounds?

8. At \$$\frac{3}{5}$ a dozen, how many dozen eggs can be bought for \$$5\frac{1}{10}$?

LESSON 14.

More Fractions in Division

Ir. Dooner has a **$2\frac{1}{2}$** lb. box of candy to ivide among **5** of his choir boys. How much andy will each boy receive? Mr. Dooner must find: How many **5**'s there re in **$2\frac{1}{2}$**.)

$$2\tfrac{1}{2} \div 5 = \frac{5}{2} \div \frac{5}{1}$$

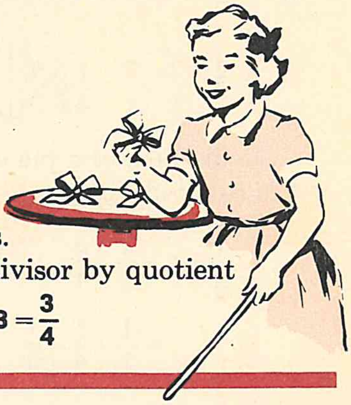
$$= \frac{\overset{1}{\cancel{5}}}{2} \times \frac{1}{\underset{1}{\cancel{5}}} = \frac{1}{2}$$

Each boy will receive $\frac{1}{2}$ lb. of candy.

Jane has $\frac{3}{4}$ of a yard of ribbon. How many bows can she make if she uses $\frac{1}{4}$ yd. for each? Jane must find how many $\frac{1}{4}$'s there are in $\frac{3}{4}$ She will divide $\frac{3}{4}$ by $\frac{1}{4}$.

$$\frac{3}{4} \div \frac{1}{4}$$

$$\frac{3}{\underset{1}{\cancel{4}}} \times \frac{\overset{1}{\cancel{4}}}{1} = \frac{3}{1} = 3$$



Jane can make 3 bows.

To check: Multiply divisor by quotient

$$\frac{1}{4} \times 3 = \frac{3}{4}$$

Divide:

. $3\frac{1}{2}$ by 14 — $8\frac{1}{3}$ by 15 — $6\frac{1}{8}$ by 28

2. $5\frac{1}{3}$ by 32 — $7\frac{1}{5}$ by 18 — $5\frac{3}{5}$ by 32

3. $9\frac{1}{3}$ by 14 — $4\frac{3}{8}$ by 42 — $6\frac{2}{9}$ by 21

4. $4\frac{1}{5}$ by 27 — $5\frac{5}{8}$ by 18 — $9\frac{3}{4}$ by 26

5. $6\frac{3}{4}$ by 36 — $8\frac{2}{3}$ by 24 — $3\frac{5}{9}$ by 24

Solve the following:

1. Sheila has $8\frac{1}{3}$ yd. of material to use for doll dresses. She wants to make 5 dresses. How much material can she allow for each?

. If \$$7\frac{1}{2}$ are divided equally among 10 boys, what part of a dollar will each receive?

3. John had $3\frac{5}{9}$ yd. of wire. He needs 8 pieces of wire of equal length. How long can he make each piece?

4. Ann had $4\frac{1}{2}$ pounds of nuts to divide equally among 9 girls. What part of a pound will each girl receive?

5. During the last 9 weeks Tom has earned \$$20\frac{1}{4}$. What did he average a week?

Divide:

1. $\frac{3}{4} \div \frac{1}{16}$ — $\frac{4}{5} \div \frac{8}{15}$ — $\frac{6}{7} \div \frac{18}{35}$

2. $\frac{7}{12} \div \frac{7}{9}$ — $\frac{9}{16} \div \frac{3}{4}$ — $\frac{20}{21} \div \frac{5}{14}$

3. $\frac{15}{16} \div \frac{5}{8}$ — $\frac{16}{21} \div \frac{32}{35}$ — $\frac{7}{12} \div \frac{35}{36}$

4. $\frac{5}{6} \div \frac{5}{24}$ — $\frac{8}{9} \div \frac{32}{45}$ — $\frac{5}{24} \div \frac{15}{32}$

5. $\frac{9}{20} \div \frac{27}{40}$ — $\frac{3}{7} \div \frac{9}{28}$ — $\frac{3}{5} \div \frac{3}{8}$

Solve the following:

1. Billy spent $\frac{1}{12}$ of an hour solving one problem; at this rate how many could he solve in $\frac{5}{6}$ of an hour?

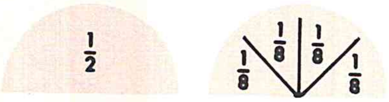
2. Mother has $\frac{7}{8}$ of a pound of butter. If she allows $\frac{1}{32}$ of a pound for each person, how many can she serve?

3. Carol had $\frac{5}{6}$ of a yard of silk cord. She cut it into pieces $\frac{1}{12}$ of a yard long. How many pieces did she have?

4. Mrs. Gans had $\frac{7}{8}$ of a pie. If she served her children each $\frac{1}{8}$ of a pie, how many children did she serve?

More Fractions in Division

Mother divided $\frac{1}{2}$ of a pie among her 4 children. How much did each receive?



To divide $\frac{1}{2}$ of a pie among 4 is to divide $\frac{1}{2}$ by 4.

$$\frac{1}{2}\div 4=\frac{1}{2}\div\frac{4}{1}$$
$$=\frac{1}{2}\times\frac{1}{4}=\frac{1}{8}$$

Each will receive $\frac{1}{8}$ of a pie.

On our Lady's altar, Rose arranged $\frac{1}{2}$ doz. lilies in each vase. How many vases did she need for $3\frac{1}{2}$ doz. lilies?

Rose must find out how many $\frac{1}{2}$'s there are in $3\frac{1}{2}$.

$$3\frac{1}{2}\div\frac{1}{2}=\frac{7}{2}\div\frac{1}{2}$$
$$=\frac{7}{\underset{1}{\cancel{2}}}\times\frac{\overset{1}{\cancel{2}}}{1}=7$$

Rose needed 7 vases.

Check $\frac{1}{2}\times\frac{7}{1}=\frac{7}{2}=3\frac{1}{2}$

If a certain plane goes $11\frac{2}{3}$ mi. in $2\frac{1}{2}$ min., how far will it go in 1 min.?

We must find how many times $2\frac{1}{2}$ is contained in $11\frac{2}{3}$.

$$11\frac{2}{3}\div 2\frac{1}{2}=\frac{35}{3}\div\frac{5}{2}$$
$$=\frac{\overset{7}{\cancel{35}}}{3}\times\frac{2}{\underset{1}{\cancel{5}}}=\frac{14}{3}=4\frac{2}{3}\text{ mi.}$$

The plane will go $4\frac{2}{3}$ mi. in 1 min.

Check $2\frac{1}{2}\times 4\frac{2}{3}=$
$$\frac{5}{\underset{1}{\cancel{2}}}\times\frac{\overset{7}{\cancel{14}}}{3}=\frac{35}{3}=11\frac{2}{3}$$

Check: divisor × quotient = dividend

Divide:

1. $\frac{1}{3}\div 2$ $\frac{1}{4}\div 3$ $\frac{1}{8}\div 2$
2. $\frac{3}{4}\div 4$ $\frac{3}{5}\div 15$ $\frac{5}{8}\div 5$
3. $\frac{11}{12}\div 2$ $\frac{3}{8}\div 6$ $\frac{4}{9}\div 8$
4. $4\frac{1}{3}\div\frac{1}{3}$ $5\frac{1}{6}\div\frac{1}{4}$ $6\frac{1}{4}\div\frac{1}{4}$
5. $7\frac{2}{3}\div\frac{5}{6}$ $5\frac{2}{5}\div\frac{3}{10}$ $4\frac{3}{4}\div\frac{1}{8}$
6. $9\frac{2}{9}\div\frac{1}{9}$ $1\frac{11}{12}\div\frac{5}{24}$ $2\frac{2}{7}\div\frac{4}{21}$
7. $8\frac{1}{3}\div 1\frac{1}{4}$ $7\frac{1}{5}\div 1\frac{1}{3}$ $6\frac{1}{4}\div 1\frac{3}{4}$
8. $4\frac{1}{6}\div 1\frac{1}{12}$ $3\frac{7}{12}\div 1\frac{1}{6}$ $2\frac{1}{2}\div 1\frac{1}{8}$
9. $3\frac{7}{9}\div 2\frac{1}{8}$ $5\frac{2}{3}\div 1\frac{1}{3}$ $6\frac{2}{5}\div 2\frac{3}{5}$
10. $6\frac{1}{8}\div\frac{7}{24}$ $5\frac{1}{7}\div 2\frac{2}{7}$ $\frac{5}{6}\div 10$
11. $\frac{1}{6}\div 4$ $3\frac{1}{3}\div\frac{2}{3}$ $4\frac{3}{8}\div 3\frac{1}{2}$

Solve the following:

1. The divisor is $\frac{1}{8}$, the dividend is $\frac{3}{4}$; what is the quotient?
2. The dividend is $4\frac{1}{5}$, the divisor is $\frac{7}{10}$; what is the quotient?
3. How many sixteenths of a pound are there in $1\frac{1}{8}$ pounds?
4. How many ninths of a yard are there in $3\frac{1}{3}$ yards?
5. How many books $\frac{2}{3}$ of an inch thick can be placed on a bookshelf 24 inches along the front?
6. How many $\frac{1}{4}$-lb. bags of nuts can be filled from a box containing $4\frac{1}{2}$ pounds?
7. The dividend is six and two-thirds, the divisor is $1\frac{4}{5}$; what is the quotient?
8. If Charles can walk $5\frac{1}{3}$ miles in $1\frac{3}{5}$ hours, how far can he walk in an hour?
9. Pilot Greene can fly his plane $22\frac{1}{2}$ mi. in $5\frac{2}{5}$ min. How far can he fly in 1 minute?

More Fractions

If Donald's motor boat can travel $\frac{3}{5}$ of a mile in $4\frac{1}{5}$ minutes, what part of a mile can it go in **1** minute? (We can find the answer by dividing $\frac{3}{5}$ by $4\frac{1}{5}$.)

$$\frac{3}{5}\div 4\frac{1}{5}=\frac{3}{5}\div\frac{21}{5}$$

$$=\frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{5}}}\times\frac{\overset{1}{\cancel{5}}}{\underset{7}{\cancel{21}}}=\frac{1}{7}$$

Donald can go $\frac{1}{7}$ of a mile a minute.

Divide:

1. $\frac{5}{8}\div 1\frac{1}{4}$ $\frac{8}{15}\div 3\frac{1}{5}$ $\frac{11}{14}\div 7\frac{1}{3}$
2. $\frac{7}{9}\div 3\frac{1}{9}$ $\frac{9}{14}\div 6\frac{3}{7}$ $\frac{7}{12}\div 8\frac{3}{4}$
3. $\frac{15}{16}\div 4\frac{3}{8}$ $\frac{11}{18}\div 9\frac{1}{6}$ $\frac{7}{18}\div 1\frac{1}{6}$
4. $\frac{4}{5}\div 2\frac{1}{10}$ $\frac{3}{8}\div 4\frac{1}{8}$ $\frac{4}{27}\div 2\frac{2}{9}$
5. $\frac{7}{12}\div 4\frac{2}{3}$ $\frac{3}{10}\div 5\frac{1}{4}$ $\frac{5}{24}\div 3\frac{1}{8}$
6. $\frac{15}{16}\div 6\frac{1}{4}$ $\frac{25}{32}\div 9\frac{3}{8}$ $\frac{4}{15}\div 7\frac{1}{5}$

Solve the following:

1. If a train goes $\frac{8}{9}$ of a mile in $1\frac{5}{27}$ minutes, what part of a mile will it go in 1 minute?

2. A certain plane can cover $\frac{3}{8}$ of a mile in $4\frac{1}{2}$ sec.; what part of a mile will it travel in 1 second?

3. If $2\frac{2}{3}$ yd. of gingham cost $\$\frac{4}{5}$, what part of a dollar will 1 yard cost?

4. When the divisor is $7\frac{1}{2}$ and the dividend is $\frac{5}{8}$, what is the quotient?

5. If $\frac{5}{6}$ of a cupful of sugar is used in making $2\frac{2}{9}$ pounds of candy, what part of a cupful will be needed to make 1 lb.?

Solve the following:

1. How many packages of coffee each weighing $1\frac{1}{3}$ lb. must I buy if I need 28 lb. of coffee?

2. If $\frac{7}{8}$ of a yard of silk cost $\$1\frac{3}{4}$, what was the price per yard?

3. During November the Walsh family used $2\frac{1}{2}$ qt. of milk every day. How many quarts did they use for the month?

4. How many inches are there in $\frac{3}{4}$ of a yard?

5. There are $16\frac{1}{2}$ feet in 1 rod. How many feet are in 4 rods?

6. How many hours are there in $2\frac{1}{2}$ days?

7. How many pieces of string $5\frac{1}{4}$ in. long can be cut from a piece 5 ft. 3 in. long?

8. A train traveled 30 miles in $\frac{2}{3}$ of an hour. What was its speed per hour?

$30\div\frac{2}{3}$ 45

9. If 60 children receive $\frac{1}{2}$ pint of milk each day, how many quarts will they use in 3 days?

10. How many $\frac{1}{2}$ pint bottles can be filled from 5 gallons of milk?

11. How many $\frac{1}{16}$ lb. pieces of butter can be cut from $\frac{7}{8}$ of a pound?

12. An engine wheel is $5\frac{1}{2}$ yd. around the outer edge. How many times must it go round to cover 110 yards?

13. What is the cost of $3\frac{1}{3}$ yd. of material at $\$1\frac{1}{5}$ a yard?

$6 \div 2 = \frac{6}{2} = 3$

$6 \div 5 = \frac{6}{5} = 1\frac{1}{5}$

$9 \div 12 = \frac{9}{12} = \frac{3}{4}$

$8 \div 24 = \frac{8}{24} = \frac{1}{3}$

Just as the sign (÷) indicates division, so also does the line between the numerator and denominator of a fraction.

The divisor is always below the line. It is the denominator.

The dividend is always above the line. It is the numerator.

The quotient is the result of the division.

3, $1\frac{1}{5}$, $\frac{3}{4}$ and $\frac{1}{3}$ are quotients.

LESSON 15.

Division Expressed as a Fraction

Express as a fraction and give the quotient:

1. 10 ÷ 5   10 ÷ 12   27 ÷ 18   18 ÷ 6

2. 27 ÷ 36   48 ÷ 16   12 ÷ 10   14 ÷ 28

3. 24 ÷ 36   18 ÷ 16   21 ÷ 42   52 ÷ 32

Another way of expressing division fractionally is by asking the question: "What part of one number is another?"

What part of 12 is 3? $\frac{3}{12} = \frac{1}{4}$

The number that follows "of" will *always* be the *denominator* of the fraction.

1. What part of den. 20 is 5?   of 36 is 4?

2. What part of 13 is 5?   of 24 is 16?

3. 9 is what part of 18?   is 10 of 15?

4. 8 is what part of 40?   is 20 of 25?

Quantities must be expressed in the same unit of measure before they can be divided, e.g.

What part of **1** ft. is **3** in.? $\frac{3 \text{ in.}}{1 \text{ ft.}} = \frac{3 \text{ in.}}{12 \text{ in.}} = \frac{1}{4}$

What part of **2** lb. is 6 oz.? $\frac{6 \text{ oz.}}{2 \text{ lb.}} = \frac{6 \text{ oz.}}{32 \text{ oz.}} = \frac{3}{16}$

What part

1. of 2 ft. is 9 in.?   of 3 wk. is 9 da.?

2. of 1 yr. is 5 mo.?   of 2 min. is 30 sec.?

3. 1 pint is what part of 1 quart?

4. 1 pint is what part of 1 gallon?

5. 9 inches is what part of 1 yard?

6. 3 days is what part of 3 weeks?

Study the following:

If **12** yd. of lace cost **72¢**, what will **3** yd. cost? (Compare the two quantities that have the same name.)

The price of **12** yd. is known.

The price of **3** yd. is asked.

Find what part of **12** yd. is **3** yd. $\frac{3}{12} = \frac{1}{4}$

Then **3** yd. will cost $\frac{1}{4}$ as much as **12** yd.

If **12** yd. cost **72¢**, **3** yd. will cost

$$\frac{1}{\cancel{4}_{1}} \text{ of } \frac{\overset{18}{\cancel{72}}}{1}¢ = \frac{18}{1}¢ = 18¢$$

Solve the following:

1. At 24¢ a foot, what will 6 in. of wire cost? (Change 1 foot to 12 in.) 12¢

2. At 96¢ an hour, what will Tom earn in 45 min.? 72¢

3. At 80¢ a lb., what will 6 oz. of tea cost? 30¢

4. At 51¢ a doz. what will 8 oranges cost? 34¢

5. If Bill earns $300 a month, what does he earn in 1 week? 75

6. If a train travels 45 mi. an hour, how far will it go in 20 minutes? 15

7. If a plane can go 100 mi. in 20 min., how far will it go in 5 minutes? 25 mi

8. When lemons are $.40 a dozen, what will 9 cost? .30

9. When lemons are 3 for 10¢ what will 9 cost? 30¢ (9 = 3 × 3)

10. When cakes are 2 for 15¢, what will 8 cost? 60¢ (8 is 4 times 2)

LESSON 16.

Complex Fractions

A fraction such as $\frac{3}{4}$ is a simple fraction. A fraction such as $\frac{6}{\frac{3}{4}}$ is a complex fraction. The numerator of the fraction is **6** (dividend). The denominator of the fraction is $\frac{3}{4}$ (divisor).

To find the value of a complex fraction, it must be changed to the form of a simple fraction.

$$\frac{6}{\frac{3}{4}}=\frac{6}{1}\div\frac{3}{4}=\frac{\overset{2}{\cancel{6}}}{1}\times\frac{4}{\underset{1}{\cancel{3}}}=\frac{8}{1}=8$$

When the divisor is less than one, the quotient is greater than the dividend.

Express **12** divided by $\frac{5}{8}$ as a complex fraction and as a simple fraction:

Complex	Simple
$\frac{12}{\frac{5}{8}}$	$\frac{12}{1}\div\frac{5}{8}$

Express as a complex and as a simple fraction:

1. 24 divided by $\frac{4}{5}$
2. 15 divided by $\frac{5}{8}$
3. 14 divided by $\frac{7}{12}$
4. 32 divided by $\frac{4}{7}$
5. 15 divided by $\frac{3}{4}$
6. 18 divided by $\frac{9}{10}$
7. 36 divided by $\frac{4}{9}$
8. 28 divided by $\frac{4}{7}$

In each of the following, state which is the divisor and find the value of the complex fraction:

1. $\frac{6}{\frac{2}{3}}$ $\frac{12}{\frac{3}{4}}$ $\frac{75}{\frac{3}{4}}$ $\frac{21}{\frac{3}{8}}$

2. $\frac{14}{\frac{2}{5}}$ $\frac{18}{\frac{6}{7}}$ $\frac{24}{\frac{8}{9}}$ $\frac{28}{\frac{7}{8}}$

3. $\frac{16}{\frac{2}{5}}$ $\frac{27}{\frac{9}{10}}$ $\frac{48}{\frac{6}{7}}$ $\frac{16}{\frac{9}{10}}$

4. $\frac{48}{\frac{18}{19}}$ $\frac{50}{\frac{15}{16}}$ $\frac{49}{\frac{14}{15}}$ $\frac{60}{\frac{12}{13}}$

5. $\frac{72}{\frac{8}{9}}$ $\frac{63}{\frac{7}{8}}$ $\frac{56}{\frac{16}{17}}$ $\frac{54}{\frac{9}{10}}$

Study the following:

If **9** yd. of velvet cost **$27**, what will **1** yd. cost?

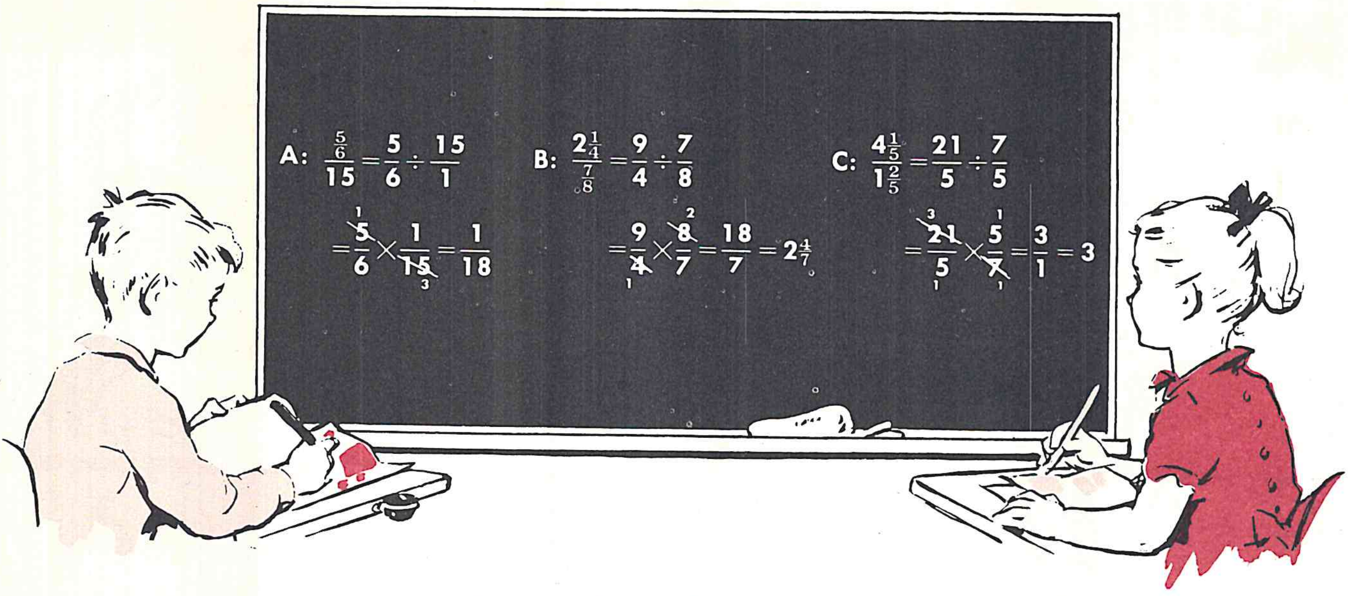
9 yd. cost **$27**
Then **1** yd. will cost $\frac{\$27}{9}=\$3$

Apply this to fractions:
If $\frac{2}{3}$ of a yd. of velvet costs **$2**, what will **1** yd cost?

$\frac{2}{3}$ yd. cost **$2**
1 yd. will cost $\frac{\$2}{\frac{2}{3}}=\frac{2}{1}\div\frac{2}{3}$
$=\frac{2}{1}\times\frac{3}{2}=\$3$

Solve:

1. If $\frac{2}{3}$ of a dozen eggs cost 40¢, what will 1 dozen cost? 60 $40\div\frac{2}{3}$
2. When $\frac{7}{8}$ of a pound of steak costs 56¢, what will 1 pound cost? 64 $56\div\frac{7}{8}$
3. If $\frac{3}{4}$ of a ton of coal can be bought for $9, what will 1 ton cost? $9\div\frac{3}{4}=\overset{3}{\cancel{9}}\times\frac{4}{\cancel{3}}=12$
4. When $\frac{4}{5}$ of a dozen of pencils costs 40¢, what will 1 dozen cost? $40\div\frac{4}{5}=\overset{10}{\cancel{40}}\times\frac{5}{\cancel{4}}=50$
5. A certain airplane can cover 168 miles in $\frac{3}{5}$ of an hour. What is its speed per hour?
$168\div\frac{3}{5}=\overset{56}{\cancel{168}}\times\frac{5}{\cancel{3}}=280$
6. If a man can walk 4 miles in $\frac{4}{5}$ of an hour, how far can he walk in 1 hour?
$4\div\frac{4}{3}=\cancel{4}\times\frac{5}{\cancel{4}}=5$
7. At what speed per hour is an automobile going if it covers 42 miles in $\frac{7}{8}$ of an hour?
$42\div\frac{7}{8}=\overset{6}{\cancel{42}}\times\frac{8}{\cancel{7}}=48$
8. If $\frac{3}{4}$ of a pound of meat costs 75¢, what will 1 pound cost?
$75\div\frac{3}{4}=\overset{25}{\cancel{75}}\times\frac{4}{\cancel{3}}=100$



A: $\frac{\frac{5}{6}}{15}=\frac{5}{6}\div\frac{15}{1}=\frac{\overset{1}{\cancel{5}}}{6}\times\frac{1}{\underset{3}{\cancel{15}}}=\frac{1}{18}$

B: $\frac{2\frac{1}{4}}{\frac{7}{8}}=\frac{9}{4}\div\frac{7}{8}=\frac{9}{\underset{1}{\cancel{4}}}\times\frac{\overset{2}{\cancel{8}}}{7}=\frac{18}{7}=2\frac{4}{7}$

C: $\frac{4\frac{1}{5}}{1\frac{2}{5}}=\frac{21}{5}\div\frac{7}{5}=\frac{\overset{3}{\cancel{21}}}{\underset{1}{\cancel{5}}}\times\frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{7}}}=\frac{3}{1}=3$

More Complex Fractions

Find the value of:

1.	$\frac{\frac{3}{4}}{12}$	$\frac{\frac{7}{8}}{14}$	$\frac{\frac{3}{5}}{9}$	$\frac{\frac{5}{9}}{15}$	$\frac{\frac{5}{6}}{25}$
2.	$\frac{3\frac{3}{4}}{\frac{1}{2}}$	$\frac{4\frac{4}{5}}{\frac{3}{4}}$	$\frac{2\frac{1}{7}}{\frac{3}{21}}$	$\frac{5\frac{1}{3}}{\frac{2}{9}}$	$\frac{9\frac{1}{3}}{\frac{7}{9}}$
3.	$\frac{15\frac{1}{2}}{2\frac{1}{2}}$	$\frac{3\frac{3}{4}}{1\frac{1}{2}}$	$\frac{4\frac{1}{5}}{1\frac{2}{5}}$	$\frac{6\frac{1}{4}}{2\frac{1}{2}}$	$\frac{8\frac{2}{3}}{3\frac{1}{2}}$
4.	$\frac{\frac{4}{5}}{\frac{1}{5}}$	$\frac{2\frac{2}{3}}{2}$	$\frac{7\frac{1}{2}}{1\frac{2}{3}}$	$\frac{2\frac{1}{2}}{\frac{3}{5}}$	$\frac{3\frac{1}{7}}{5\frac{1}{2}}$
5.	$\frac{3\frac{1}{2}}{1\frac{3}{4}}$	$\frac{\frac{3}{4}}{\frac{2}{3}}$	$\frac{10\frac{2}{3}}{4}$	$\frac{\frac{2}{3}}{6}$	$\frac{7\frac{1}{6}}{10}$
6.	$\frac{\frac{3}{5}}{3}$	$\frac{\frac{9}{10}}{\frac{3}{5}}$	$\frac{7\frac{3}{4}}{4}$	$\frac{3\frac{1}{2}}{6}$	$\frac{\frac{3}{4}}{\frac{1}{16}}$
7.	$\frac{2\frac{1}{2}}{7}$	$\frac{\frac{5}{16}}{\frac{5}{8}}$	$\frac{4\frac{2}{3}}{6}$	$\frac{\frac{5}{6}}{\frac{1}{3}}$	$\frac{6\frac{1}{8}}{3}$
8.	$\frac{\frac{5}{6}}{2\frac{1}{3}}$	$\frac{\frac{7}{10}}{3\frac{1}{5}}$	$\frac{8\frac{1}{4}}{4\frac{1}{8}}$	$\frac{10\frac{1}{2}}{1\frac{3}{4}}$	$\frac{\frac{3}{10}}{\frac{3}{4}}$

Solve:

1. The width of a sheet of paper in our tablets is $7\frac{1}{2}$ in. If a sheet is divided into 3 equal parts, how wide is each part?

$2\frac{1}{2}$

2. At our party we served $6\frac{1}{2}$ qt. of ice cream. If each person received $\frac{1}{6}$ of a quart, how many people were served?

39

3. Tom helped Mr. Gould make up boxes of Christmas candy. He packed $7\frac{1}{2}$ lb. of hard candy into $\frac{1}{2}$-lb. boxes. How many boxes did he fill?

15

4. Mrs. Morgan has $2\frac{1}{2}$ candy bars to give to 5 children. What fractional part will each child receive?

$\frac{1}{2}$

5. Our scout troop can walk on an average of $3\frac{1}{8}$ miles per hour. How long will it take them to walk $12\frac{1}{2}$ miles?

4 hrs

6. Jack and Tom climbed the Blue Mountain by a trail $8\frac{1}{4}$ miles in $2\frac{1}{2}$ hours. Find their average speed per hour.

$3\frac{3}{10}$

$8\frac{1}{4}\div2\frac{1}{2}=$

7. How many $\frac{5}{8}$ bu. baskets can be filled from 95 bu. of tomatoes?

$95\div\frac{5}{8}=152$

Problems in Fractions

1. Father Blanchfield's baseball club practiced $1\frac{7}{8}$ hours on Monday, $\frac{3}{4}$ of an hour on Tuesday, $2\frac{2}{3}$ hours on Wednesday. How many hours did they practice altogether?

2. Father purchased 9 baseball suits for his team. If one suit cost $\$13\frac{2}{3}$, what was the total cost of the suits?

3. A baseball bat costs $\$3\frac{3}{5}$ and a ball costs $\$2\frac{9}{10}$. Find the difference between these prices.

4. Last week the sixth grade team practiced $19\frac{1}{2}$ hours altogether. If this was an average of $3\frac{1}{4}$ hours a day, on how many days did they practice?

5. The seventh grade team saved $\$17\frac{4}{5}$ toward their spring camping trip. The sixth grade team saved $\$18\frac{3}{4}$. How much more than the seventh grade team did the sixth grade team save?

6. On the hiking trip the boys walked $8\frac{1}{3}$ miles in the morning, and after lunch $6\frac{2}{9}$ miles. The remaining distance of $5\frac{5}{6}$ miles to their destination was completed by evening. How far had the boys walked altogether?

7. The boys took 20 lb. of potatoes with them to roast. If each potato averaged $3\frac{1}{5}$ ounces in weight, how many potatoes did they have?

8. Bill cut $\frac{7}{8}$ inches of wire from a line $2\frac{3}{4}$ inches long. What length of wire remained?

9. The boys had drilling exercises for a total of 83 minutes each day. How many times a day did they drill, if each drill period lasted for $20\frac{3}{4}$ minutes?

10. Some of the boys decided to row $12\frac{1}{2}$ miles down the river to the nearest town to buy some supplies. Dan took the oars for $3\frac{1}{4}$ mi., Terry for $2\frac{1}{7}$ mi., and Tom for the remaining distance. How far did Tom row?

UNIT 2 Test

Write the answers on your test paper:

Part I

1. A fraction expresses parts of a .....(?).....

2. A proper fraction is one whose value is .....(?)..... than a whole.

3. A whole number and a fraction is called a .....(?).....

4. A fraction whose value is equal to a whole is an .....(?)..... fraction.

5. In a proper fraction the numerator is .....(?)..... than the denominator.

6. A fraction whose value is greater than a whole is an .....(?)..... fraction.

7. In addition of fractions, we .....(?)..... the numerators.

8. In subtraction of fractions, we .....(?)..... the numerators.

9. In multiplication of fractions, we .....(?)..... the numerators and the denominators.

10. In an improper fraction, the numerator is either equal to or .....(?)..... .....(?)..... the denominator.

Part II

1. $6\frac{8}{9}+4\frac{1}{3}$ $= \frac{11}{9} = 11\frac{2}{9}$
   $6\frac{8}{9} + \frac{3}{9}$

2. $4\frac{5}{12}-2\frac{5}{8}$
   $\frac{10}{24} - \frac{15}{24} = 1\frac{19}{24}$

3. $7\frac{1}{2} \div 1\frac{1}{5}$
   $\frac{15}{2} \times \frac{5}{6} = \frac{75}{12} = 6\frac{1}{4}$

4. $1\frac{5}{7} \times 5\frac{5}{6}$
   $\frac{12}{7} \times \frac{35}{6} = \frac{70}{7} = 10$

5. $2\frac{3}{4}+6\frac{3}{5}$
   $\frac{15}{20}$ $\frac{12}{20}$ $= 9\frac{7}{20}$

6. $3-\frac{5}{6}$
   $= 2\frac{1}{6}$

7. $8\frac{1}{6} \div \frac{7}{9}$
   $\frac{49}{6} \times \frac{9}{7} = \frac{21}{2}$ $10\frac{1}{2}$

8. $1\frac{1}{5} \times 3\frac{1}{8}$
   $\frac{6}{5} \times \frac{25}{8} = \frac{15}{4} = 3\frac{3}{4}$

9. $\dfrac{9}{3\frac{3}{8}}$

10. $\dfrac{4\frac{4}{9}}{8}$

11. $\dfrac{\frac{2}{7}}{1\frac{1}{5}}$

Part III

Match Column B with Column A:

	A	B
1.	a (?) Complex fraction	(a) $\frac{3}{\frac{1}{2}}$
2.	f (?) Improper fraction	(b) $\frac{9}{12}$ and $\frac{81}{108}$
3.	d (?) Proper fraction	(c) 13
4.	c (?) Prime number	(d) $\frac{2}{3}$
5.	h (?) Composite number	(e) $\frac{7}{9}$ and $\frac{56}{81}$
6.	i (?) Mixed number	(f) $\frac{8}{8}$
7.	g (?) L.C.M. of 4–6	(g) 12
8.	j (?) Multiplication	(h) 6
9.	b (?) Equal value	(i) $3\frac{1}{2}$
10.	e (?) Unequal value	(j) of

Part IV

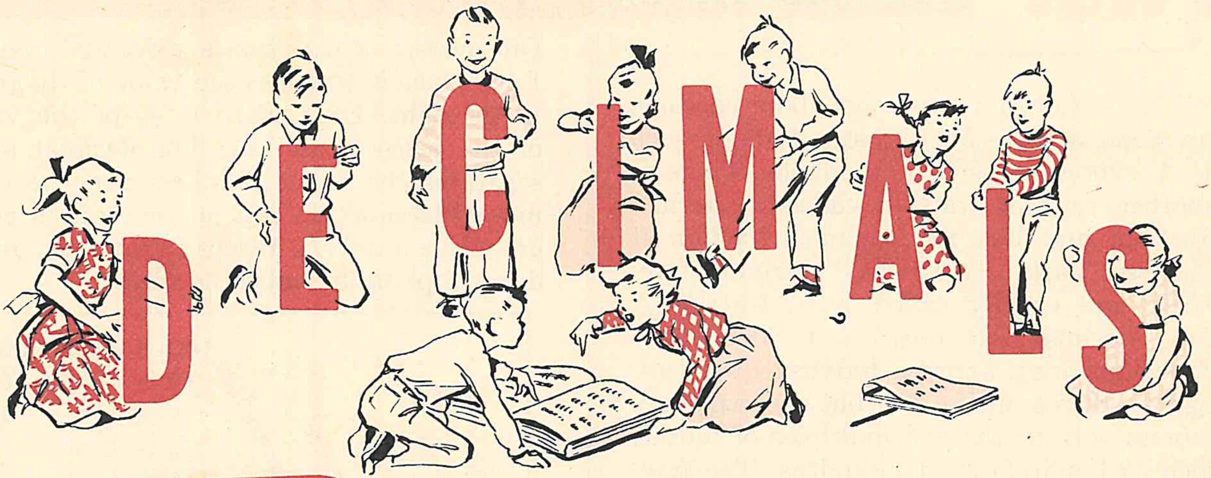
1. If Donald spent $\frac{1}{6}$ of an hour to solve 1 problem, how many problems could he solve in $1\frac{2}{3}$ hr.?
   $1\frac{2}{3} \div \frac{1}{6} = \frac{5}{3} \times \frac{6}{1} = \frac{10}{1} = 3$

2. A new road $3\frac{8}{9}$ miles long was built in $2\frac{1}{3}$ months. At this rate how much of the road was built each month?

3. Raymond earned $\$6\frac{2}{5}$. If he donated $\frac{1}{8}$ of it to the missions, what part of his money did he donate?

4. The minuend is $12\frac{5}{9}$. The subtrahend is $9\frac{2}{3}$. What is the difference?

5. The morning class in Saint John School lasts $2\frac{3}{4}$ hours. The afternoon class lasts $2\frac{3}{10}$ hours. How many hours are the children in school each day?



UNIT 3 • WORKING WITH DECIMALS

We have learned that:
Parts of whole numbers can be expressed by means of fractions. Now we are going to learn that another way of expressing parts of whole numbers is by means of decimal fractions. The word *decimal* is taken from a Latin word "decem", meaning ten. The Romans considered March the first month of the year, and named the tenth month, December. Thus *decimal* and *December* contain the same root "decem." Decimal fractions refer to fractions with a denominator of **10** or a multiple of **10**, such as $\frac{3}{10}$, $\frac{7}{100}$, $\frac{9}{1,000}$. When such fractions are written as decimals, the numerator remains, but the denominator is shown by the decimal point, and the place which the figure holds to the right of the decimal point. $\frac{4}{10} = \mathbf{.4}$ $\frac{4}{100} = \mathbf{.04}$

How Well Do You Remember?

Give the answers orally:

1. Parts of whole numbers can be expressed by means of fractions (?). The fraction $\frac{7}{10}$ indicates that a unit has been divided into (?) whole equal parts, and that each of these parts is $\frac{1}{10}$ of the (?).

2. In the fraction $\frac{7}{10}$, the numerator (?) shows the (?) number of parts being considered, the denominator shows the (?) name or the size of the parts.

3. Another way of expressing parts of a unit is by means of de(?)al. The word is derived from the root (?) decem meaning ten.

Decimal fractions refer to fractions with a denominator of 10 (?) or a (?) multiple of 10.

4. $\frac{3}{10}$ is read three (?) tenths, and .3 is read three (?) tenths. $\frac{7}{100}$ is read seven (?) hundredth, and .07 is read seven (?) hundredths.

5. $\frac{3}{10} + \frac{1}{10} = \frac{\quad}{10}$ $\frac{7}{100} + \frac{9}{100} = \frac{\quad}{100}$

$.3 + .1 =$ (?) $\frac{4}{10}$ or .4 $.07 + .09 =$ (?) $\frac{16}{100}$ or .16

6. The first place to the right of the decimal point is called (?) tenths, and the (?) second place is called (?) hundredth.

LESSON 1

Decimal Fractions

We have studied a great deal about common fractions, and we know that a fraction such as $\frac{4}{5}$ expresses part of a whole. There is another type of fraction called a decimal fraction, and like the common fraction it expresses part of a whole. "Common fractions" are usually called just "fractions," and "decimal fractions," just "decimals." Fractions may express halves, quarters, eighths, thirds, fifths, etc., but decimals may express only tenths and multiples of tenths, such as hundredths, thousandths. The fraction $\frac{3}{10}$ may be changed to a decimal by dropping the denominator **10** and placing a decimal point to the left of the numerator **3**. $\frac{3}{10} = .3$. The fraction and the decimal are read alike—"three tenths." Also $\frac{16}{100} = .16$. The fraction and the decimal are read "sixteen hundredths."

Express as decimals:

1. $\frac{2}{10}$ $\frac{4}{10}$ $\frac{6}{10}$ $\frac{7}{10}$ $\frac{5}{10}$ $\frac{8}{10}$ $\frac{1}{10}$ $\frac{9}{10}$

2. $\frac{21}{100}$ $\frac{37}{100}$ $\frac{52}{100}$ $\frac{64}{100}$ $\frac{67}{100}$ $\frac{16}{100}$

3. $\frac{18}{100}$ $\frac{29}{100}$ $\frac{85}{100}$ $\frac{78}{100}$ $\frac{59}{100}$ $\frac{34}{100}$

4. $\frac{48}{100}$ $\frac{37}{100}$ $\frac{92}{100}$ $\frac{89}{100}$ $\frac{65}{100}$ $\frac{72}{100}$

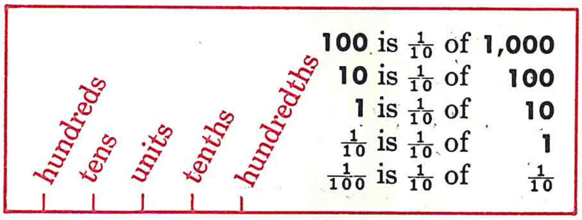
5. $\frac{54}{100}$ $\frac{93}{100}$ $\frac{86}{100}$ $\frac{13}{100}$ $\frac{67}{100}$ $\frac{26}{100}$

6. $\frac{87}{100}$ $\frac{45}{100}$ $\frac{32}{100}$ $\frac{55}{100}$ $\frac{95}{100}$ $\frac{99}{100}$

7. $\frac{19}{100}$ $\frac{76}{100}$ $\frac{56}{100}$ $\frac{68}{100}$ $\frac{75}{100}$ $\frac{25}{100}$

8. $\frac{43}{100}$ $\frac{94}{100}$ $\frac{15}{100}$ $\frac{17}{100}$ $\frac{77}{100}$ $\frac{61}{100}$

Our system of notation is a decimal system. Each place is **10** times the value of the place to its right. Each place is $\frac{1}{10}$ of the value of the place to its left. The decimal point separates the whole numbers and the decimals. Places to the left of the decimal point are whole numbers. Places to the right of the decimal point are called decimals.



100 is $\frac{1}{10}$ of **1,000**
10 is $\frac{1}{10}$ of **100**
1 is $\frac{1}{10}$ of **10**
$\frac{1}{10}$ is $\frac{1}{10}$ of **1**
$\frac{1}{100}$ is $\frac{1}{10}$ of $\frac{1}{10}$

Fractions have a numerator and a denominator.

In the fraction:

$\frac{\mathbf{21}}{\mathbf{100}}$ the numerator **21** tells the number of parts
the denominator **100** tells the name of the parts

.21 The number **21** tells the number of parts. The *name* of the parts is known by the place that **21** holds to the right of the decimal point. If the decimal ends in the second place to the right of the decimal point, its *name* is hundredths.

Mixed Decimals:

$3\frac{6}{10}$ is a mixed number and **3.6** is a mixed decimal. They are both read **3** *and* **6** tenths. $4\frac{24}{100} = \mathbf{4.24}$—read **4** *and* **24** hundredths.

Read the following:

1. 6.4 2.5 8.9 6.7 7.4

2. 8.16 3.72 4.58 9.31 7.35

Express as mixed decimals:

1. $3\frac{4}{10}$ $5\frac{7}{10}$ $8\frac{29}{100}$ $7\frac{34}{100}$ $8\frac{56}{100}$

2. $7\frac{9}{10}$ $9\frac{7}{10}$ $25\frac{76}{100}$ $4\frac{71}{100}$ $2\frac{54}{100}$

LESSON 2

Reading and Writing Decimals

The decimal takes its name from the *place* where the number ends. Numbers that end in the second place to the right of the decimal point take the name *hundredths*.

$\frac{4}{100}$ = **.04** Both are read "four hundredths."
.04 means **0** tenths, **4** hundredths.
Zero is used in the tenths' place to indicate there are no tenths, and to keep **4** in the hundredths' place.

Express as decimals:

$\frac{6}{100}$ $\frac{5}{100}$ $\frac{1}{100}$ $\frac{3}{100}$ $\frac{7}{100}$ $\frac{9}{100}$ $\frac{4}{100}$

Read and explain each of the following as shown:

.65 means **6** tenths, five hundredths
.07 means **0** tenths, seven hundredths
4.08 means **4** units, **0** tenths, eight hundredths

1. .09 .35 .57 .08 .48
2. .06 .63 .05 .92 .03
3. .85 .02 .94 .69 .01
4. 9.71 2.68 7.04 3.98 5.83
5. 6.08 4.03 2.19 7.05 3.17

Give the answers orally:

If the decimal ends in the first place to the right of the decimal point, the name of the decimal is ......(?)......

If the decimal ends in the second place to the right of the decimal point, the name of the decimal is ......(?)......

In the number 4.03, zero is used to show that there are no ......(?)......, and to keep 3 in the ......(?)...... place.

The number **55.55** is read:
Fifty-five and fifty-five hundredths.
The value of each **5** changes according to its place.

55.55 means:

5 tens + **5** units + **5** tenths + **5** hundredths
50 + **5** + **.5** + **.05**

$55.55 is read: Fifty-five dollars and fifty-five cents. **$55.55** means:

5 ten-dollars + **5** one-dollars + **5** dimes + **5** cents
$50 + **$5** + **$.50** + **$.05**

10 cents = **1** dime
10 dimes = **1** dollar
100 cents = **1** dollar

1 dime = **.1** of a dollar
1 cent = **.1** of a dime
1 cent = **.01** of a dollar

Read and tell what each of the following means:

1. $75.34 $82.06 $31.40 $15.05
2. $20.09 $90.08 $40.06 $30.04
3. $15.70 $24.60 $90.80 $70.10
4. $35.80 $40.01 $82.06 $44.44
5. $19.08 $32.06 $22.22 $66.66

Give the answers orally:

1. 1 is $\frac{1}{10}$ of ...(?)..... .1 is $\frac{1}{10}$ of .1...(?).......
2. .01 is $\frac{1}{10}$ of .1(?)... .01 is $\frac{1}{100}$ of 1...(?).......
3. 10 is 10 times(?) 1 is 10 times .1...(?).....
4. .1 is 10 times(.01?). 1 dollar is 10 times(?) 10¢
5. In the number 40.06 there are(?)tens(4?) units (?0) tenths ..06.. hundredths. 06
6. In the number $40.06 there are 4(?) dollars,(?)one – dollars,(?) dimes, and(?)cents.
0 0 6

LESSON 3.

Thousandths in Decimals

The name of the third place to the right of the decimal point is thousandths.

$\frac{264}{1000}$ = **.264** Both are read "Two hundred sixty-four thousandths."

$\frac{24}{1000}$ = **.024** Both are read "twenty-four thousandths."

3$\frac{24}{1000}$ = **3.024** Both are read "Three and twenty-four thousandths."

$\frac{4}{1000}$ = **.004** Both are read "Four thousandths." Zeros are used to show that there are no tenths and no hundredths, and to keep **4** in the thousandths' place.

If the decimal ends in the *third* place to the *right* of the decimal point, its name is *thousandths.*

Write as decimals or mixed decimals:

1.	$\frac{324}{1000}$	$\frac{814}{1000}$	$5\frac{923}{1000}$
2.	$\frac{416}{1000}$	$\frac{736}{1000}$	$9\frac{815}{1000}$
3.	$\frac{32}{1000}$	$\frac{85}{1000}$	$7\frac{24}{1000}$
4.	$\frac{8}{1000}$	$\frac{7}{1000}$	$1\frac{5}{1000}$
5.	$\frac{72}{1000}$	$\frac{9}{1000}$	$4\frac{28}{1000}$
6.	$8\frac{416}{1000}$	$3\frac{746}{1000}$	$5\frac{18}{1000}$

Reading Decimals:

Read a decimal as you would a whole number and then give it its name according to the place in which it ends.

In reading a decimal such as **.004**, cover all but the **4.** Read the number that you see —"**4.**" Now look at **.004**, and ask yourself the question, "In what place to the right of the decimal point does the decimal end?" Your answer is "In the third place." You know the name of the third place is thousandths. Therefore, **.004** is read "four thousandths."

Read the following:

1.	.005	.009	7.045	8.032
2.	.006	.008	3.002	9.005
3.	.074	.648	9.806	2.405
4.	6.03	2.08	7.04	14.6
5.	18.7	4.17	5.009	8.065

In the number 456.327 the name

1. of the first place to the left of units is (?) tens

2. of the first place to the right of units is (?) Tenths

3. of the second place to the left of units is (?) hundred

4. of the second place to the right of units is (?) hundredths

5. of the third place to the left of units is (?) none

6. of the third place to the right of units is (?) thousandths

In the number 6,854.029 there are how many

........(a) thousands? 6 ....9 (b) thousandths?

........(c) hundreds? 8 ....2 (d) hundredths?

........(e) tens? 5. 4 units ....0 (f) tenths?

........(g) units? decimals

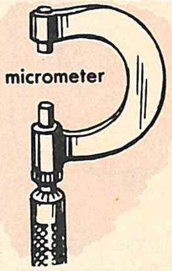
The decimal point separates the whole number from the ....(?).... [illegible]

LESSON 4.

Ten-Thousandths in Decimals

Ten-thousands (10 times 1000)	**10,000** units
Thousands (10 times 100)	**1000** units
Hundreds (10 times 10)	**100** units
Tens (10 times 1)	**10** units
nits (10 times .1)	**1 unit**
decimal point	•
enths (10 times .01)	.1 of a unit
undredths (times .001)	.01 of a unit
thousandths (times .0001)	.001 of a unit
en-thousandths (10 times .00001)	.0001 of a unit

From the chart we can see that the center of the system of notation is the **Units'** place. The decimal point does not occupy a place. We know that decimals express parts of a unit. Some of these parts are so small that they can hardly be perceived by the human eye. Yet they are common in industry. An inspector in an airplane factory or in an automobile plant has to measure very minute parts such as $\frac{1}{100}$ of an inch, $\frac{1}{1000}$ of an inch or $\frac{1}{10000}$ of an inch. The tiniest mistake would cause serious trouble, so instruments are used for measuring these fine parts. A micrometer can measure to $\frac{1}{10000}$ of an inch. $\frac{1}{10000}$ = .0001. These are read one ten-thousandth. Do you have any idea of how tiny .0001 of an inch really is?



If the decimal ends in the fourth place to the right of the decimal point, the name of the decimal is ten-thousandths.

$\frac{15}{10000}$ = .0015 **$\frac{324}{10000}$ = .0324** **$\frac{4679}{10000}$ = .4679** **$2\frac{429}{10000}$ = 2.0429**

Express as decimals:

1. $\frac{32}{10000}$ $\frac{164}{10000}$ $\frac{6875}{10000}$ $\frac{921}{10000}$
2. $\frac{4}{10000}$ $\frac{3486}{10000}$ $\frac{9}{10000}$ $\frac{1409}{10000}$
3. $\frac{361}{10000}$ $\frac{57}{10000}$ $\frac{82}{10000}$ $\frac{7}{10000}$
4. $\frac{16}{10000}$ $\frac{385}{10000}$ $\frac{56}{10000}$ $\frac{5}{10000}$
5. $\frac{3409}{10000}$ $\frac{73}{10000}$ $\frac{185}{10000}$ $\frac{9428}{10000}$
6. $\frac{72}{10000}$ $\frac{16}{10000}$ $\frac{34}{10000}$ $\frac{58}{10000}$
7. $\frac{621}{10000}$ $\frac{18}{10000}$ $\frac{342}{10000}$ $\frac{194}{10000}$

Read the following decimals and mixed decimals:

1. .0003 .0008 .0005 .0009
2. .0025 .0063 .0057 .0084
3. .0361 .0452 .0846 .0935
4. .8426 .8324 .7912 .9185
5. 15.06 43.75 8.007 6.409
6. 32.18 3.594 4.308 92.08

Supply the missing words:

1. If the decimal ends in the fourth place to right of the decimal point, its name is ......(?)...... $\frac{1}{10000}$
2. Hundredths end in the ......(?)...... place to the ......(?)...... of the decimal point. second right
3. Thousandths end in the ......(?)...... place to the ......(?)...... of the decimal point. 3rd right
4. .01 is ......(?)...... times .0001 100

LESSON 5.

Writing Decimals

In writing decimals, think first of the number of decimal places needed.

To write tenths, one decimal place is needed; hundredths, two decimal places are needed. To write a decimal such as twenty-three thousandths, think: "thousandths-three places, but only two figures are given. Therefore zero is needed in the tenths place."

Look for "and"—It tells you where to place the decimal point when you have whole numbers and decimals.

Write the following in figures:

1. Twenty-three hundredths
2. Eighty-nine thousandths
3. Fifty-eight thousandths
4. Three and four tenths
5. Eight and seven hundredths
6. Nine and twenty-seven thousandths
7. Four and seventy-eight hundredths
8. Seven and sixty-three thousandths
9. Fifty-two and one hundred four thousandths
10. Thirty-nine and forty-one thousandths
11. Eighty-three and seven thousandths
12. Nineteen and twenty-one hundredths
13. Fifty-four and eighteen thousandths
14. Sixteen and two hundred four thousandths
15. Nineteen and nine hundredths
16. Forty-eight thousandths
17. Forty-eight and forty-eight thousandths
18. Five and one hundred ten-thousandths

Accuracy is very important when you read and write whole numbers and decimals.

1. Three hundred six thousandths **.306**
2. Three hundred *and* six thousandths **300.006**
3. One hundred seven thousandths **.107**
4. One hundred *and* seven thousandths **100.007**

The value of **1** and **2** above differs very greatly. Yet the only difference between them in the *reading* is "*and.*" The same is true of **3** and **4.**

Write the following in figures:

1. Two hundred four thousandths
2. Two hundred and four thousandths
3. Five hundred two thousandths
4. Five hundred and two thousandths
5. Four hundred seven thousandths
6. Four hundred and seven thousandths
7. Eight hundred three thousandths
8. Eight hundred and three thousandths
9. Six hundred twenty-four thousandths
10. Six hundred and twenty-four thousandths
11. Three hundred forty-nine thousandths
12. Three hundred and forty-nine thousandths
13. Nine hundred sixty-three thousandths
14. Nine hundred and sixty-three thousandths
15. Ninety-four and ninety-four thousandths
16. One hundred and one hundredth
17. Seven hundred and seven hundredths
18. Six hundred and six hundredths
19. Forty and five hundred six thousandths
20. Thirty and two hundred two thousandths
21. Five hundred and five hundredths
22. Three hundred five and two thousandths

LESSON 6.

Zeros in Decimals and Whole Numbers

10×4 = 40 **100×4 = 400**

Zero placed to the right of a whole number multiplies it by **10**.

Two zeros placed to the right of a whole number multiply it by **100**.

But,

$6 may be written **$6.00**

There is no change in value because **6** with no tenths and no hundredths is still **6**

Compare:

$$\frac{5}{10} = \frac{50}{100} = \frac{500}{1000} = \frac{5000}{10000}$$

.5 = .50 = .500 = .5000

So **.5** is equal in value to **.5000**

Zeros placed to the right of a decimal do not change the value

Which is larger **.5** or **.49**?

To compare tenths and hundredths, first express the tenths as hundredths. Then compare the decimals.

.5 = .50 **.49 = .49**

.5 is larger than **.49**

Arrange in order of their ascending values:

.42 **.6** **.204** **.08**

.08 .204 .42 .6

To compare these decimals, they must have the same name or the same denominator. They must be expressed as thousandths.

.42 = .420 **.204 = .204**
.6 = .600 **.08 = .080**

Arranged in order of their ascending values they are

.08 **.204** **.42** **.6**

Arrange the following in order of their descending values:

.125, .56, .2, .79, .324

.125 .2 .324 .56 .79 ←

Compare **.15** and **.137** and tell which is larger

.15 and **.137 = .150** and **.137**

.15 is larger than **.137**

Compare each pair, and tell which is larger

1. .07 and .189 .09 and .0956
2. .08 and .462 .06 and .6715
3. .5 and .042 .8 and .0087
4. .9 and .687 .7 and .0891
5. .6 and .048 .39 and .3962

The decimal point is very important as you can see by the following examples:

Insert the decimal point in each.

1. Mary's hat cost $575. $5.75
2. Bill is 45 feet tall. 4.5
3. Dorothy's spelling average was 905. 90.5
4. Beatrice used 39 yds. of silk to make a dress. 3.9
5. Marie practiced on the piano 15 hours yesterday. 1.5
6. My arithmetic book cost $120. $1.20
7. Mr. Curran drove his automobile 858 miles in two hours. 85.8
8. John wanted to write two and three tenths for his answer. He wrote 23. Correct his mistake. ~~$1.20~~ 2.3
9. Mother cooked a turkey that weighed 126 pounds. 12.6
10. Our classroom is 208 feet long. 20.8
11. Tom's batting average is 1275. .1275
12. Joan's jumping rope is 55 feet long. 5.5
13. Grandmother's flower garden is 25 feet wide and 68 feet long. 2.5 6.8
14. Bill gave his mother a box of candy which weighed 15 pounds. 1.5
15. Our television screen is 12 feet wide. 1.2
16. John paid $875 for his new shoes. $8.75

LESSON 7.

Changing Decimals to Fractions

To change a decimal to a fraction:

$.47 = \frac{47}{100}$
$.309 = \frac{309}{1000}$
$.06 = \frac{6}{100} = \frac{3}{50}$
$.075 = \frac{75}{1000} = \frac{3}{40}$

To change a mixed decimal to a mixed number:

$3.4 = 3\frac{4}{10} = 3\frac{2}{5}$
$2.19 = 2\frac{19}{100}$
$10.008 = 10\frac{8}{1000} = 10\frac{1}{125}$

In changing a decimal to an equivalent fraction:

1. The numerator of the fraction is the figure or figures to the right of the decimal point.
2. The denominator of the fraction is **10,000, 1000,** etc., according to the place where the decimal ends. (An easy way to write the denominator is: **1** for the decimal point, and a zero for each decimal place.)
3. Reduce the fraction to lowest terms where necessary.

Write as fractions in their lowest terms:

1. .8 $\frac{8}{10} = \frac{4}{5}$ .25 $\frac{25}{100} = \frac{1}{4}$ .04 $\frac{4}{100} = \frac{1}{25}$ .006 $\frac{6}{1000} = \frac{3}{250}$
2. .4 $\frac{4}{10} = \frac{2}{5}$ .15 $\frac{15}{100} = \frac{3}{20}$ .08 $\frac{8}{100} = \frac{4}{50} = \frac{2}{25}$ .004 $\frac{4}{1000}$
3. .5 $\frac{5}{10} = \frac{1}{2}$ .65 $\frac{65}{100} = \frac{13}{20}$ .02 $\frac{2}{100} = \frac{1}{50}$ .025 $\frac{25}{1000} = \frac{1}{40}$
4. .9 $\frac{9}{10}$ .45 $\frac{45}{100} = \frac{9}{20}$ .07 $\frac{7}{100}$ .125 $\frac{125}{1000} = \frac{1}{8}$
5. .2 $\frac{2}{10} = \frac{1}{5}$ .75 $\frac{75}{100} = \frac{3}{4}$ .09 $\frac{9}{100}$ .875 $\frac{875}{1000} = \frac{7}{8}$
6. .6 $\frac{6}{10} = \frac{3}{5}$ .35 $\frac{35}{100} = \frac{7}{20}$ .05 $\frac{5}{100} = \frac{1}{20}$ .625
7. .3 $\frac{3}{10} =$ .85 $\frac{85}{100} = \frac{17}{20}$ .03 $\frac{3}{100}$ .008 $\frac{8}{1000} = \frac{1}{125}$
8. .1 $\frac{1}{10}$ .95 $\frac{95}{100} = \frac{19}{20}$ .01 $\frac{1}{100}$ .075 $\frac{75}{1000}$
9. .7 $\frac{7}{10}$ .55 $\frac{55}{100} = \frac{11}{20}$ .06 $\frac{6}{100}$ .002 $\frac{2}{1000} = \frac{1}{500}$
10. .12 $\frac{12}{100} = \frac{3}{25}$ .16 $\frac{16}{100} = \frac{4}{25}$ .24 $\frac{24}{100} = \frac{12}{50} = \frac{6}{25}$ .005 $\frac{5}{1000} = \frac{1}{200}$

1. 1.5 $= 1\frac{1}{2}$ 8.25 4.075
2. 7.3 $= 7\frac{3}{10}$ 4.45 6.025
3. 4.6 $= 4\frac{3}{5}$ 3.65 5.205
4. 5.9 $= 5\frac{9}{10}$ 6.55 7.105
5. 6.8 $= 6\frac{4}{5}$ 4.95 3.005
6. 3.2 $= 3\frac{1}{5}$ 8.65 2.004
7. 8.1 $= 8\frac{1}{10}$ 7.06 $7\frac{3}{50}$ 1.006
8. 2.4 $= 2\frac{2}{5}$ 8.04 $8\frac{1}{25}$ 9.008 $9\frac{1}{125}$
9. 1.7 $= 1\frac{7}{10}$ 5.02 8.003 $8\frac{3}{1000}$
10. 9.8 $= 9\frac{4}{5}$ 3.01 4.035

Give the answers orally.

1. To change a decimal to an equivalent fraction, the figure or figures to the right of the decimal point become the ......(?)...... of the fraction.
2. Fractions should always be reduced to ......(?)......
3. The denominator will have as many zeros as there are ......(?)...... .... in the number.
4. A number such as 6.04 is called a ......(?)......

LESSON 8.

Decimals in Addition

When we add decimals we must be sure they have the same name.
We can make them have the same name by adding zeros to the right of the decimal; as
$.7+.08=.70+.08$.

Fractions	Decimals
$\frac{3}{10}$	.3
$\frac{6}{10}$	.6
$\frac{4}{10}$	.4
$\frac{13}{10}=1\frac{3}{10}$	1.3

13 tenths = **1** unit and **3** tenths. Write **3** tenths in the tenths' column and **1** in the units' column. The sum is **1** and **3** tenths.

Fractions	Decimals
$4\frac{7}{10}$	4.7
3	3.0
$6\frac{4}{10}$	6.4
$13\frac{11}{10}=14\frac{1}{10}$	14.1

Arrange in columns and add:

.3, 12.9, .25, 1.8

$$\begin{array}{r} .30 \\ 12.90 \\ .25 \\ 1.80 \\ \hline 15.25 \end{array}$$

The sum is read **15** and **25** hundredths.

In adding decimals keep in mind:
Decimal point must go under decimal point.
Tenths go under tenths, hundredths under hundredths, etc.
Decimal point in the sum must be under the other decimal points.
Annex zeros to the right where necessary to give the decimals the same name.
Carry from one column to another as you do in whole numbers.

Add:

1.	.3	.7	.4	.2	.9
	.7	.5	.2	.9	.4
	.2	.8	.3	.5	.2
	.4	.3	.6	.6	.3
		2.3	1.5	2.2	1.8

2.	.8	.6	.2	.9	.5
	.5	.3	.7	.3	.6
	.6	.5	.9	.7	.4
	.2	.7	.4	.4	.3

3.	.07	.60	.09	.15	.07
	.80	.35	.45	.09	.50
	.04	.70	.17	.16	.03
	.06	.25	.05	.03	.20
	.97	1.90	.76	.43	.80

Add:

1.	.30	.25	.37	.80	.87
	.45	.60	.14	.30	.60
	.40	.10	.50	.15	.20
	.06	.42	.90	.70	.70
	1.21	1.37	1.91	1.95	2.37

2.	.47	.68	.92	.09	.54
	.50	.70	.53	.40	.20
	.78	.34	.76	.35	.60
	.29	.56	.07	.60	.42

Arrange in columns and add:

1. .3, 1.04, 2.4, 4.07
2. 12.14, 7.06, 312, 5.04
3. 3.7, 9.03, 4.6, 8.35
4. 4.76, 3.04, 2.1, .45
5. 1.08, 7.5, 4.9, .06
6. .16, .2, .08, 1.32

LESSON 9. Zeros in Decimals

Sometimes zeros must be retained, and sometimes they may be dropped.

2.04—Zero is needed to keep **4** in the hundredths' place, and to indicate no tenths.

$1.40—Zero is retained because two decimal places are needed for cents.

1.40—Zero is not needed. Zeros may be added to the right of a decimal without changing its value, so they may be dropped without changing the value of the decimal.

$4.00—Zeros may be dropped or they may be retained when necessary. **$4** or **$4.00.**

Add and in the sum drop the zeros that are unnecessary:

1.	.574	.234	.525	.724
	.930	.617	.645	.342
	.858	.428	.647	.151
	.723	.741	.233	.243
	3.085	2.020	2.05~~0~~	1.46~~0~~
2.	3.505	.004	3.145	2.017
	.650	3.123	.036	5.342
	7.042	2.461	.824	.035
	.103	.012	2.003	1.006
	11.30~~0~~	5.60~~0~~	6.008	8.40~~0~~

Arrange in columns and add:

3. $.05 +$.85 +$3.50+$5 = $9.40

4. $6 +$3.50+$.87 +$.03 = $10.40

5. $7.00+$8.50+$.30 +$.20 = $16.00

6. $4.01+$.07 +$.90 +$2.05 = $7.03

7. $2 +$.05 +$.20 +$2.05 = $4.30

8. .1 +.01 +.001 +1.01 = 1.121

9. .5 +.005 +4.05 +.05 = 4.605

In the following examples, explain why the zeros are dropped or kept.

(a)	(b)	(c)	(d)
.524	$3.40	.435	.4151
.066	.25	.250	.0263
.800	4.02	.809	.4150
.630	2.53	.506	.1438
2.020	$10.20	2.000	1.0002

Study the following:

(a) **5.0603** means **5** units, no tenths, **6** hundredths, no thousandths, **3** ten-thousandths.

(b) In **36.087** there are **6** units, **7** thousandths, no tenths, **3** tens, **8** hundredths

Supply the missing words:

1. In the number 4.305

5 tells the number of thous. ?

3 tells the number of tenths

4 tells the number of units

0 tells the number of hundredths

2. 14.0203 means

1 ....?........ 4 ....?........ 0 ....?........

2 ....?........ 0 ....?........ 3 ....?........

3. In 46.072 there are

6 ....?........ 7 ....?........ 4 ....?........

2 ....?........ 0 ....?........

4. In the number 32.106

1 tells the number of ....?........

6 tells the number of ....?........

2 tells the number of ....?........

0 tells the number of ....?........

3 tells the number of ....?........

LESSON 10. Decimals in Subtraction

In examples B, C, and D explain the zero in each answer. Tell why it may or may not be dropped.

A.	B.	C.	D.	E.
$6\frac{9}{10} = 6.9$ $4\frac{8}{10} = 4.8$ $2\frac{1}{10} = 2.1$	$1\frac{25}{100} = 1.25$ $1\frac{18}{100} = 1.18$ $\frac{7}{100} = .07$	$4\frac{36}{100} = 4.36$ $2\frac{26}{100} = 2.26$ $2\frac{10}{100} = 2.10$	$\begin{array}{r} \$4.55 \\ 2.45 \\ \hline \$2.10 \end{array}$	$.3 - .03 = .30$ $\begin{array}{r} .03 \\ \hline .27 \end{array}$

Subtract:

1. $$\begin{array}{r} .7 \\ .3 \\ \hline .4 \end{array} \qquad \begin{array}{r} .5 \\ .1 \\ \hline .4 \end{array} \qquad \begin{array}{r} .9 \\ .4 \\ \hline .5 \end{array} \qquad \begin{array}{r} .8 \\ .5 \\ \hline .3 \end{array} \qquad \begin{array}{r} .6 \\ .2 \\ \hline .4 \end{array}$$

2. $$\begin{array}{r} 15.6 \\ 7.3 \\ \hline 8.3 \end{array} \qquad \begin{array}{r} 25.9 \\ 4.5 \\ \hline 21.4 \end{array} \qquad \begin{array}{r} 36.3 \\ 10.1 \\ \hline 26.2 \end{array} \qquad \begin{array}{r} 40.6 \\ 18.4 \\ \hline 22.2 \end{array}$$

3. $$\begin{array}{r} 7.3 \\ 4.1 \\ \hline 3.2 \end{array} \qquad \begin{array}{r} 9.4 \\ 3.2 \\ \hline 6.2 \end{array} \qquad \begin{array}{r} 8.6 \\ 5.3 \\ \hline 3.3 \end{array} \qquad \begin{array}{r} 5.7 \\ 1.4 \\ \hline 4.3 \end{array}$$

4. $$\begin{array}{r} 1.45 \\ 1.15 \\ \hline .3 \end{array} \qquad \begin{array}{r} 2.37 \\ 2.19 \\ \hline .18 \end{array} \qquad \begin{array}{r} 3.54 \\ 3.27 \\ \hline .27 \end{array} \qquad \begin{array}{r} 4.63 \\ 4.39 \\ \hline .24 \end{array}$$

5. $$\begin{array}{r} 1.35 \\ 1.29 \\ \hline .06 \end{array} \qquad \begin{array}{r} 2.54 \\ 2.46 \\ \hline .08 \end{array} \qquad \begin{array}{r} 9.80 \\ 9.73 \\ \hline .07 \end{array} \qquad \begin{array}{r} 8.73 \\ 8.65 \\ \hline .08 \end{array}$$

6. $$\begin{array}{r} 4.75 \\ 2.25 \\ \hline 2.5 \end{array} \qquad \begin{array}{r} 6.87 \\ 3.37 \\ \hline 3.5 \end{array} \qquad \begin{array}{r} 8.54 \\ 4.64 \\ \hline 3.9 \end{array} \qquad \begin{array}{r} 7.32 \\ 3.42 \\ \hline 3.9 \end{array}$$

7. $$\begin{array}{r} \$6.50 \\ 5.25 \\ \hline \$1.25 \end{array} \qquad \begin{array}{r} \$9.75 \\ 1.55 \\ \hline \$8.20 \end{array} \qquad \begin{array}{r} \$5.40 \\ 1.15 \\ \hline \$4.25 \end{array} \qquad \begin{array}{r} \$7.00 \\ 2.50 \\ \hline \$4.50 \end{array}$$

8. $$\begin{array}{r} \$9.90 \\ 8.50 \\ \hline \$1.40 \end{array} \qquad \begin{array}{r} \$7.26 \\ 6.66 \\ \hline \$.60 \end{array} \qquad \begin{array}{r} \$8.35 \\ 7.25 \\ \hline \$1.10 \end{array} \qquad \begin{array}{r} \$4.63 \\ 3.83 \\ \hline \$.80 \end{array}$$

9. $$\begin{array}{r} .50 \\ .05 \\ \hline .45 \end{array} \qquad \begin{array}{r} .90 \\ .07 \\ \hline .83 \end{array} \qquad \begin{array}{r} .80 \\ .08 \\ \hline .72 \end{array} \qquad \begin{array}{r} .40 \\ .04 \\ \hline .36 \end{array}$$

Subtract:

1. seven tenths from nine tenths .2
2. four tenths from seven tenths .3
3. three tenths from six tenths .3
4. three and five tenths from seven and seven tenths 4.2
5. six and three tenths from nine and one tenth 2.8
6. two and thirteen hundredths from two and twenty hundredths .07
7. five and twelve hundredths from six and ten hundredths .98
8. eight and twenty-five hundredths from nine and thirty hundredths 1.05
9. three and sixteen hundredths from six and six hundredths 2.9
10. seven and five hundredths from seven and fifteen hundredths .1
11. two dollars and twenty-five cents from eight dollars and fifty-five cents $6.30
12. four hundredths from four tenths .36

	From:	Take:
1.	.7 take .15 = .55	.23 from .4 = .17
2.	.8 take .13 = .67	.16 from .7 = .54
3.	.9 take .26 = .64	.05 from .3 = .25
4.	.5 take .12 = .38	.09 from .1 = .01
5.	.3 take .24 = .06	.27 from .3 = .03
6.	.6 take .42 = .18	.17 from .2 = .03

More Decimals in Subtraction

A.

From **.1** take **.0896**
1000 minuend
.0896 subtrahend
.0104 difference or remainder

B.

From **9** take **.035**
9.000
.035
8.965

C.

Take **$6** from **$6.30**
$6.30
6.00
$ .30

In **C**, the answer may be written **$.30** or **$0.30**.

Supply zeros where necessary and subtract:

1.	6.0045 .64	17.057 3.5	4.6 .0204
2.	7. .34	8. .96	9. .23
3.	.1 .0765	.3 .2594	.4 .3902
4.	1. .0398	5. .9875	6. .7909
5.	.09 .009	.8 .0008	.1 .0039
6.	2.1 .009	3.4 .8976	5.1 .9803
7.	$6.30 2.	$9.65 4.	$8.95 8.
8.	$7.40 7.	$8.20 8.	$5.60 5.
9.	8. 2.30	7. .805	.9 .0834
10.	5.8 4.9206	9.1 7.0613	3. 2.994

Remember:
Place decimal point under decimal point.
Place each figure in the correct column.
Place decimal point in the answer under the other decimal points.
Subtract as you do in whole numbers.

	From:	Take:
1.	.6 take .17	.025 from .03
2.	.09 take .009	.065 from .4
3.	.8 take .008	.125 from 6
4.	.1 take .035	.961 from 2
5.	.04 take .027	.805 from 9
6.	1.1 take .6	.006 from .54
7.	1.85 take .085	.025 from .25
8.	$2 take $1.60	$2.15 from $2.20
9.	$7 take $6.24	$3.95 from $8

10. From $5.17 take $4.87

11. How much more than $4.50 is $6?

12. How much less than $8.90 is $7.90?

13. How much less than $300 is $287.09?

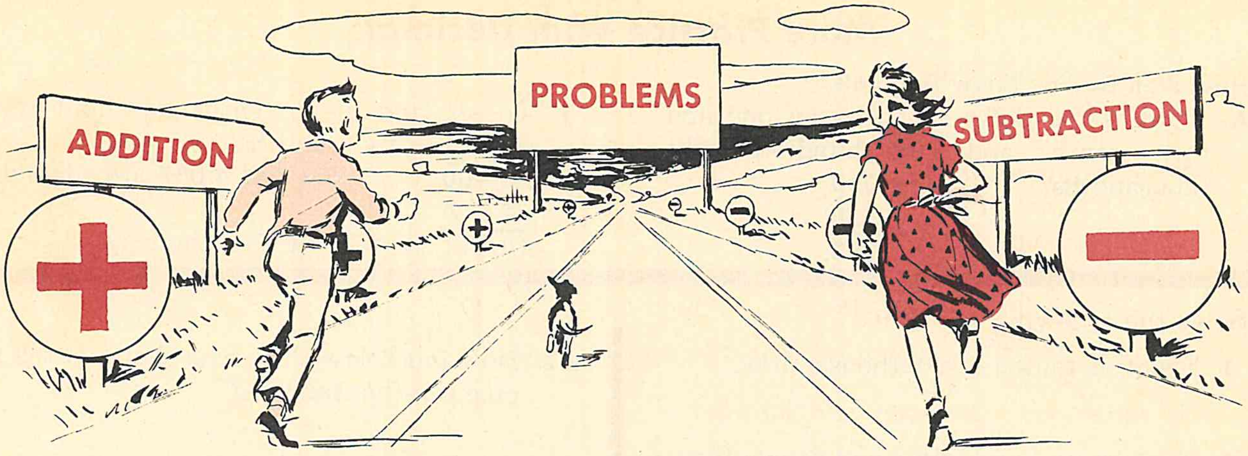
14. What is the difference between 1 tenth and 1 hundredth?

15. How much more than 3 hundredths is 2 tenths?

16. How much more is 4 tenths than 6 thousandths?

17. How much less is 3 hundredths than 3 tenths?

18. How much more than 5 thousandths is 7 thousandths?



Problems in Addition and Subtraction

1. What is the sum of 1.5, 3.25, and 450?

2. What is the difference between .16 and .016?

3. Subtract the sum of 2.15 and 3.2 from 6.

4. How much less than 10 is 8.5?

5. The minuend is .003 and the subtrahend is .0003. What is the remainder?

6. One pilot's plane averaged 210.5 miles an hour. Another plane averaged 210.475 miles. By how much did one outdo the other?

7. The sum of .05 and .3 is how much less than the sum of 1 and .04?

8. At the broad jump tryout Bob jumped 4.1 feet and Earl jumped 4.05 feet. Which boy made the better record and by how much?

9. Francis is 4.6 feet tall. His father is 6 feet tall. What is the difference in their height?

10. Last month Mary weighed 76.05 pounds. If she has gained 3.5 pounds since then, what is her present weight?

11. What number must be added to the sum of .4 and .04 to make 1?

12. When a certain number is added to 3.5 the sum is 4.05. What is the number?

13. When a certain number is subtracted from 6.3 the difference is 1.07. What is the number?

14. The sum of 3.6 and another number is 5.67. What is the number?

15. Angela lives 2.4 miles from school. Patricia lives .8 of a mile from school. How much farther than Patricia does Angela live?

16. Mr. Dolan's yacht can make 15.5 miles per hour. Mr. Dinger's yacht can make 16 miles an hour. What is the difference in their speed?

17. Mary's mother bought two new dresses. One was $9 and the other was $10.50. How much change would she receive from a twenty-dollar bill?

More Practice With Decimals

How Well Do You Know Decimals?

A. What is the difference between one and three tenths and nine hundred eight thousandths?

$$\begin{array}{r} \mathbf{1.300} \\ \mathbf{.908} \\ \hline \mathbf{.392} \end{array}$$

B. To six and eight tenths add four and seventeen thousandths.

$$\begin{array}{r} \mathbf{6.800} \\ \mathbf{4.017} \\ \hline \mathbf{10.817} \end{array}$$

6.8 and **4.017** are addends

10.817 is the sum.

Solve the following:

1. From six tenths take 9 thousandths.

2. To thirteen hundredths add fifteen thousandths.

3. Which is larger and by how much: Two and eighteen hundredths or two and eighteen thousandths?

4. What is the sum of three and four hundredths and eight and nine tenths?

5. The minuend is three and four thousandths, the subtrahend is two and nine tenths. What is the remainder?

6. What is the difference between eight and ninety-four hundredths and six hundred three thousandths?

7. What is the answer to one minus seventy-four thousandths?

8. How much is two more than thirty-four hundredths?

9. What must be added to one and five thousandths to make two?

10. What must be added to six thousandths to make six hundredths?

11. How much less than nine thousandths is nine ten-thousandths?

12. How much more than three ten-thousandths is three thousandths?

13. One addend is four and two tenths, another is four hundredths. What is the sum?

14. What must be added to thirty-four hundredths to make four tenths?

15. Tom earned four dollars and thirty-five cents one week, and five dollars and twenty-five cents the following week. What did he earn in the two weeks?

16. Bill saved six dollars and twenty cents. He spent one dollar and seventy-five cents. How much had he left?

17. Marie has seven dollars and five cents in the bank. Her brother John has nine dollars and fifty cents in his. How much more than Marie has John?

UNIT 3 Test

Part I

Write as words in your notebook:

1. 12.06 14.81 5.125
2. 6.025 8.306 9.006
3. 182.3 368.9 .0235
4. 300.003 .303 .8004
5. 400.009 .409 .7002

Part II

Write the following in figures:

1. Eight and fourteen hundredths.
2. Thirty-five thousandths.
3. Three and nineteen thousandths.
4. Eighteen and four hundredths.
5. Ninety-four and seven tenths.
6. Eighty-nine and six hundredths.
7. Two hundred and three thousandths.
8. Two hundred three thousandths.
9. Four thousand forty and three hundredths.
10. Six hundred and eighty-one thousandths.

Part III

Find the missing words:

1. The name of decimals that end in the second place to the right of the decimal point is ....(?)....
2. The name of decimals that end in the ....(?).... place to the right of the decimal point is ten-thousandths.
3. The name of decimals that end in the ....(?).... place to the right of the decimal point is thousandths.
4. Decimals express parts of a ....(?)....
5. In writing a number such as two and thirteen hundredths the word "and" tells where the ....(?).... is to be placed.
6. In reading a mixed decimal the word "....(?)...." is read after the whole number.
7. In reading the number 900.004 the word "and" will be read after ....(?)....
8. The ....(?).... separates the whole number from the decimal.
9. Places to the right of the decimal point are ....(?)....
10. Zeros at the ....(?).... of a decimal may be dropped.

Part IV

Write as decimals:

1. $\frac{3}{100}$ $\frac{41}{100}$ $\frac{7}{10}$ $\frac{91}{1000}$ $\frac{8}{1000}$
2. $8\frac{46}{100}$ $3\frac{9}{10}$ $4\frac{17}{1000}$ $9\frac{406}{1000}$
3. $7\frac{8}{100}$ $9\frac{6}{1000}$ $4\frac{31}{1000}$ $7\frac{186}{10000}$
4. $600\frac{6}{1000}$ $\frac{606}{1000}$ $500\frac{9}{1000}$ $\frac{509}{1000}$
5. $10\frac{7}{100}$ $500\frac{5}{1000}$ $7\frac{3}{100}$ $80\frac{37}{1000}$

Part V

1. The number 4,306.529 contains

......?......thousands ......?......thousandths

......?......hundreds ......?......hundredths

......?......tens ......?......tenths

......?......units

2. In the number 8,597.624 there are

......?......hundredths ......?......units

......?......thousands ......?......tenths

......?......thousandths ......?......hundreds

3. In the number 666.66 each 6 is ......?...... times the value of the 6 to its right. Each 6 is ......?...... times the value of the 6 to its left.

Part VI

Match column **B** with column **A**:

A	B
1. (?) .025	4 a. unnecessary zero✓
2. (?) .67	b. $\frac{1}{10}$ of $\frac{1}{10}$✓
3. (?) .0003	c. mixed number✓
4. (?) $4.60	d. thousandths✓
5. (?) .01	e. 33 hundredths✓
6. (?) $\frac{10}{100}$	f. ten-thousandths✓
7. (?) 1 − .3	g. necessary zero✓
8. (?) .50	h. hundredths✓
9. (?) 3.4	i. seven-tenths
10. (?) .3 + .03	j. ten-hundredths

Part VII

Cross out the zeros that are unnecessary in rows 1 and 2.

1.	$6.40	$6.04	$.04	9.060
2.	.304	.340	.300	10.090

3. How many dimes are there in $.90?

4. Write seven dimes as a decimal

5. Write seven cents as a decimal

6. .73 + .06 + .019 + 4.1 = ...?......

7. 1.006 − .7862 = ...?......

8. From 5.5 take .555

9. Which is larger .82 or .9?

10. The minuend is 0.65, the subtrahend is .06. What is the difference?

Part VIII

1. Add together as decimals: .6, .205, $\frac{3}{10}$, .75, and $3\frac{7}{1000}$

2. How much less than 1 is the sum of .08, .006, .307, and .4?

3. Find by subtraction the difference in value between the two four's in the number 42.614

4. A piece of wire 1.75 feet long was cut from a piece 3 feet long. How much wire was left?

5. From the sum of 6.05 and 7.008 take the sum of 4.8 and 3.006

6. From the sum of 6.8 and 3.04 take the difference between 4.95 and 2.006

UNIT 4 • MORE WORK WITH DECIMALS

We add and subtract decimals as we add and subtract whole numbers, but we must always remember the importance of the decimal point. Now we are going to learn how to multiply and divide decimals.

Decimals are multiplied just as whole numbers are, but again the decimal point plays a very important part. If the multiplier is a whole number and there are tenths or hundredths in the multiplicand, the product must have the same number of decimal places as the multiplicand. When there are decimals in both the multiplicand and the multiplier, the product must have as many decimal places as there are in both multiplicand and multiplier. In dividing a decimal by a whole number the decimal point in the quotient is above the one in the dividend.

Give the answers orally:

How Well Do You Remember?

1. In multiplying tenths by a whole number, how many decimal places must the product always contain?
2. In multiplying hundredths by a whole number, how many decimal places must the product always contain?
3. If any decimal containing hundredths is multiplied by a whole number, how many decimal places must the product always contain?
4. When there are tenths in the multiplicand and in the multiplier, how many decimal places must there be in the product?

5. $6 \times .8 =$ ……?…… $9 \times .08 =$ ……?……

6. $4 \times .125 =$ ……?…… $4 \times .025 =$ ……?……

7. $8 \times 4.6 =$ ……?…… $9 \times 6.15 =$ ……?……

8. $3 \times \$6.40 =$ ……?…… $7 \times \$4.25 =$ ……?……

9. $6\overline{)\$3.66} =$ ……?…… $5\overline{)10.55} =$ ……?……

10. $4\overline{)\ 4.84} =$ ……?…… $6\overline{)\ 8.76} =$ ……?……

11. $3\overline{)\ 7.35} =$ ……?…… $7\overline{)2.268} =$ ……?……

LESSON 1.

Multiplying Decimals

Vincent has three packages each weighing $\frac{9}{10}$ of a pound. How much do the three packages weigh?

We can find the answer by adding

$$\frac{9}{10} + \frac{9}{10} + \frac{9}{10} = \frac{27}{10} = 2\frac{7}{10} \text{ pounds}$$

A shorter way is to multiply.

$$3 \times \frac{9}{10} = \frac{27}{10} = 2\frac{7}{10} \text{ pounds}$$

If we express $\frac{9}{10}$ as a decimal we have **.9**

Adding	Multiplying
$\begin{array}{r} \mathbf{.9} \\ \mathbf{.9} \\ \underline{\mathbf{.9}} \\ \mathbf{2.7} \end{array}$	$\begin{array}{rl} \mathbf{.9} & \text{(1 decimal place)} \\ \underline{\times \mathbf{3}} & \text{(no decimal place)} \\ \mathbf{2.7} & \text{(1 decimal place)} \end{array}$

Vincent's packages weigh **2.7** pounds.

Multiply **2.35** by **3**:

Adding	Multiplying
$\begin{array}{r} \mathbf{2.35} \\ \mathbf{2.35} \\ \underline{\mathbf{2.35}} \\ \mathbf{7.05} \end{array}$	$\begin{array}{rl} \mathbf{2.35} & \text{(2 decimal places)} \\ \underline{\times \mathbf{3}} & \text{(no decimal place)} \\ \mathbf{7.05} & \text{(2 decimal places)} \end{array}$

When multiplying a decimal or a mixed decimal by a whole number, be sure to point off in the product as many decimal places as there are in the multiplicand. When pointing off decimal places in the product, start at the right and go toward the left.

$$\begin{array}{r} \mathbf{\$4.35} \\ \underline{\times \mathbf{8}} \\ \mathbf{\$34.80} \end{array}$$

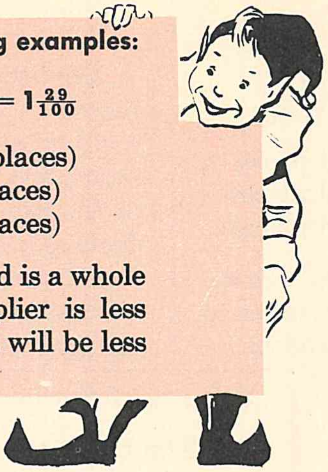
Multiply:

1.	.6 3	.4 3	.7 3	.5 3	.8 3
2.	.8 4	.7 4	.6 4	.9 4	.5 4
3.	.9 5	.6 5	.3 5	.8 5	.4 5
4.	1.7 6	9.3 6	2.5 6	3.9 6	5.8 6
5.	2.6 7	4.8 7	6.4 7	8.3 7	3.9 67
6.	3.5 8	.9 8	1.8 8	5.4 38	.7 8
7.	.8 9	2.5 39	64.3 59	.6 9	18.8 9
8.	76.1 246	85.5 37	86.4 8	93.6 123	3.9 6
9.	24.5 237	45.2 345	37.6 432	52.7 314	62.8 243

10.	3.45 9	4.16 9	5.05 9	6.27 9
11.	2.80 18	3.75 28	4.56 58	5.23 38
12.	5.30 57	6.23 17	9.08 27	4.15 87
13.	5.3 6	4.35 24	6.21 46	.38 15
14.	8.25 125	6.49 234	4.30 432	.63 89
15.	9.5 9	8.43 28	7.25 134	.91 15
16.	26.1 25	35.2 7	4.62 159	8.73 46
17.	4.56 435	78.3 246	75.4 76	.85 83
18.	5.37 234	63.5 432	9.23 324	84.3 423

LESSON 2.

Multiplying a Whole Number by a Decimal



Compare the following examples:

A. $\frac{3}{100}\times 43=\frac{129}{100}=1\frac{29}{100}$

B.
43 (no decimal places)
.03 (2 decimal places)
1.29 (2 decimal places)

When the multiplicand is a whole number and the multiplier is less than a unit, the product will be less than the multiplicand.

Multiply:

1.	67 .05	85 .08	94 .04	76 .09
2.	89 .25	73 .38	58 .46	49 .57
3.	135 1.04	246 2.90	468 3.86	579 4.87
4.	2846 12.10	3579 13.56	1234 .75	3450 .36
5.	75 .84	184 2.50	2356 3.82	4263 14.56

Solve the following:

1. Mr. Kane surveyed a 240-acre farm and found that .17 of it was swamp land. How many acres were swamp land?
2. The multiplicand is 750. The multiplier is .08. What is the product?
3. If the average speed of a westbound train is 55 m.p.h., how far will it go in 2.8 hr.?
4. Michael saved $65 last year. At this rate how much will he save in 2.4 yr.?

If a plane averages **324** miles an hour, how far will it go in **7.5** hours?

Here we have a whole number mutliplied by a mixed decimal.

32 4 (no decimal places)
7.5 (1 decimal place)
162 0
2268
2430.0 (1 decimal place)
The plane will go **2,430** miles.

Multiply:

1.	247 6.5	348 8.3	476 9.4	958 8.7
2.	346 3.5	715 4.2	814 7.5	945 5.6
3.	1234 21.5	3478 32.6	2456 42.5	387 1.9
4.	89 7.5	246 8.5	375 12.8	3575 24.4
5.	135 1.4	579 20.3	642 40.5	598 4.5

Solve the following:

1. If an airplane travels 250 m.p.h. how far will it travel in 9.5 hours?
2. The multiplicand is 1,450 and the multiplier is 30.6. Find the product.
3. There are 60 minutes in an hour. How many minutes are there in 4.5 hours?
4. Betty can read 26 pages in an hour. At this rate, how many pages can she read in 2.5 hr.?

LESSON 3.

Multiplying a Decimal by a Decimal

Compare the following examples:

A. $\frac{3}{10} \times \frac{7}{10} = \frac{21}{100}$

B. **.7** (1 decimal place)
$\times$**.3** (1 decimal place)
.21 (2 decimal places)

Both answers are read: **21** hundredths.

C. $\frac{9}{100} \times \frac{7}{10} = \frac{63}{1000}$

D. **.7** (1 decimal place)
$\times$**.09** (2 decimal places)
.063 (3 decimal places)

Zero had to be written in tenths' place in order to express **63** thousandths.

Add the number of decimal places in the multiplicand to the number of decimal places in the multiplier. Counting from the right in the product, point off as many decimal places as there are in both multiplicand and multiplier. If necessary, add zeros to the left in the product, as shown in Example D.

Multiply:

1.	.7 .8	.2 .6	.4 .3	.9 .2	.5 .3
2.	.6 .4	.2 .7	.4 .5	.5 .6	.3 .4
3.	.9 .05	.8 .07	.3 .04	.5 .03	.7 .06
4.	.4 .07	.9 .03	.8 .05	.5 .04	.9 .05
5.	.05 .7	.09 .6	.03 .4	.07 .3	.04 .8
6.	.14 .6	.12 .4	.35 .5	.64 .8	.72 .3
7.	.003 .4	.007 .3	.009 .7	.006 .8	.002 .9
8.	.074 .5	.048 .5	.045 .06	.095 .2	.036 .5
9.	.04 .6	.4 .06	.06 .7	.6 .07	.07 .06
10.	.7 .4	.07 .04	.007 .4	.3 .08	.005 .09
11.	.017 .9	.07 .3	.46 .07	.72 .04	.09 .06
12.	.006 .6	.12 .4	.16 .08	.13 .05	.25 .08

Solve the following:

1. The boy scouts of our school walked 5.4 miles in one hour. At this rate how far will they walk in 6 hours?
2. One sheet of tin is .06 of an inch thick. Find the thickness of 6 sheets.
3. At the rate of 5.25 miles per minute, how far will an airplane travel in an hour?
4. If a car averages 16.4 miles on one gallon of gasoline, what distance should it cover on 10 gallons?
5. The round-trip distance between our school and the park is 8.2 miles. The day of our school picnic the bus made 9 round-trips. How many miles was this?
6. One piece of cardboard is about .062 of an inch thick. What is the thickness of 8 pieces of this cardboard?
7. A gallon of oil weighs about 6.5 lb. What will 50 gallons of oil weigh?
8. Bob's sister types at the rate of 60 words per minute. How many words can she type in 2.5 minutes?
9. If an airplane averages 159.6 miles per hour, how many miles will it travel in 12.5 hours?
10. If the quotient is .0054 and the divisor is .6, what is the dividend?

A.

$$\begin{array}{r} 4.6 \\ \times .35 \\ \hline 230 \\ 138 \\ \hline 1.610 \end{array}$$

B.

$$\begin{array}{r} 32.06 \\ 1.07 \\ \hline 2\,24\,42 \\ 32\,06\,0 \\ \hline 34.30\,42 \end{array}$$

The answer to **B** is read: thirty-four and three-thousand forty-two ten-thousandths.

LESSON 4.

More Decimals in Multiplication

Multiply:

1.	4.6 .45	9.8 .25	8.5 .36	2.8 .75
2.	8.5 .34	3.4 .85	5.2 7.5	3.7 .56
3.	8.7 .49	5.5 .68	2.5 .36	6.8 .25
4.	1.9 .88	3.8 .76	7.6 .47	4.3 .58
5.	$52.03 2.06	$17.05 5.04	$50.68 4.07	$65.05 3.02
6.	$43.07 8.05	$72.04 6.09	$24.06 3.04	$39.08 7.06
7.	56.01 9.06	34.09 6.02	46.07 4.06	19.09 3.08
8.	72.05 3.05	69.06 4.07	54.07 7.05	43.08 8.07
9.	2.9 .75	57.02 5.09	7.6 .84	37.09 4.08
10.	52.04 7.06	7.3 .39	48.06 8.07	3.5 .84
11.	83.62 9.2	30.59 6.5	8.6 .35	4.75 7.4
12.	1.4 .45	96.82 .92	34.8 .74	8.64 .54
13.	$24.56 3.05	$14.85 6.3	$10.86 .34	$34.28 2.07

Solve these problems:

1. Traveling at the rate of 28.5 miles per hour, how far can a bus go in 3.8 hours?

2. Jerry weighs 76.4 lb. His brother's weight is 1.1 of this. Find his brother's weight.

3. A plane flying from Seattle to San Diego at the rate of 119.5 miles per hour will cover how many miles in 10.2 hr.?

4. At the rate of 2.75 m.p.h., how far will a Boy Scout troop hike in 4.5 hours?

5. In constructing an airplane Mr. Powell used 23.4 feet of steel tubing. What did it cost at $1.50 a ft.?

6. The boys at Saint Mary School purchased new gym suits at $5.25 each. If there are 209 boys on roll, how much did the suits cost?

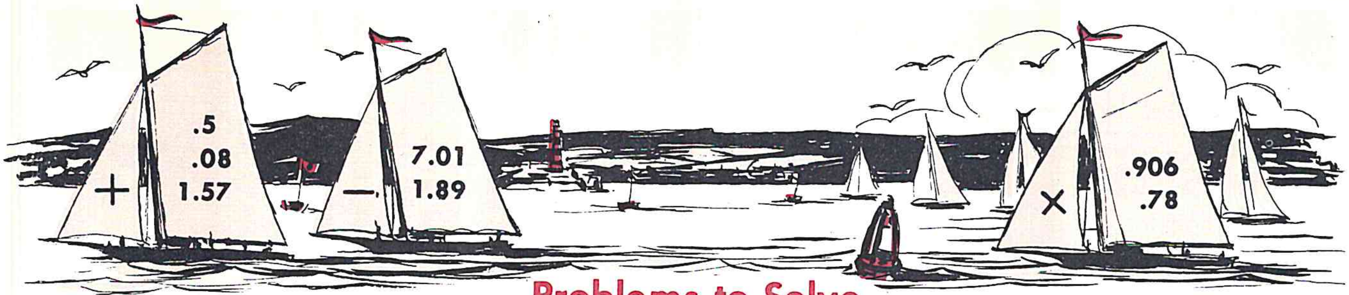
7. The average weight of a chicken is 5 lbs. What is the weight of 24 chickens?

8. Mr. Gould's car averages 16.5 miles per gallon of gasoline. How many miles can he go on 45.5 gallons of gas?

9. Mr. Mill's farm contains 107.5 acres. Mr. Murray's farm is 5.2 times as large. How large is Mr. Murray's farm?

10. If a saleman's expenses for one day amounted to $13.75, what would his expenses be for a business trip of 9.3 days?

11. If the multiplicand is 3.5 and the multiplier is 36.78, what is the product?



Problems to Solve

1. Mr. White drove his car .81 of a mile in one minute. How far will he go in one hour?

2. A swimming pool is 44.5 feet long. If a boy swims it 30 times, how many yards will he have covered?

3. Mr. Power owns a piece of property that is 130.4 feet long and 110.05 feet wide. How much shorter is the width than the length?

4. When Mr. Bell started on his trip to Denver his speedometer read 1837.6 miles. When he reached his destination, the speedometer read 2384.3 miles. How many miles had he traveled?

5. Change to fractions and add:
.05, .5, and .025

6. Change to fractions and tell by how much one is greater than the other: .125, .0625

7. Ada uses .75 of a yard for each bow she makes. How much ribbon will she need for 24 bows?

8. If one yard of serge costs $2.35, how much will 6.4 yards cost?

9. What number is 1 more than 19.08?

10. What number is .2 less than 6.18?

11. If one package weighs 1.25 pounds, how many pounds will 18 such packages weigh?

12. Tom weighs 70.4 pounds. Fred is 1.25 as heavy. What does Fred weigh?

13. The base of one tree measures 19 feet. The base of another is 10.08 feet. What is the difference in their widths?

14. How much longer is a 1.25 inch nail than a .625 inch nail?

15. Instead of subtracting .6 from 1 Linda added .6 to 1. How far was she from the right answer?

16. What is the cost of .75 of a yard of lace at $2.20 per yard?

17. How many yards will George walk in 150 steps if he covers 2.25 feet at each step?

18. If .003 is multiplied by .02, how many decimal places are in the product?

19. On Tuesday the weatherman registered that .08 of an inch of rain had fallen. On Wednesday, he registered .7 of an inch. How much more rain fell on Wednesday than on Tuesday?

20. How much more than 6.009 is .15 times 40.8?

21. Marie bought $5\frac{1}{2}$ yards of material to make a costume for the school play. If she paid $.59 a yard, what was the total price of the material?

22. How much more than 6.2 is 11.8?

23. A shipment of oranges numbered 1728. .65 of this shipment spoiled. Find the number spoiled.

LESSON 5.

Multiplying Decimals by 10 and 100

To multiply a whole number by **10**, annex one zero to the right of the number, as **10 × 4 = 40.**

To multiply a decimal by **10**, move the decimal point *one* place to the right, as **10 × .4 = 4.**

Study the following so that you will understand the above rule:

$$\begin{array}{r} .35 \\ \times 10 \\ \hline 3.50 = 3.5 \end{array} \qquad \begin{array}{r} .093 \\ \times 10 \\ \hline .930 = .93 \end{array} \qquad \begin{array}{r} 4.009 \\ \times 10 \\ \hline 40.090 = 40.09 \end{array}$$

The way for sixth-grade pupils to multiply a decimal by **10** is

10 × .35 = 3.5 **10 × .093 = .93**

10 × 4.009 = 40.09

To multiply a whole number by **100**, annex two zeros to the right of the number, as **100 × 4 = 400.**

To multiply a decimal by 100, move the decimal point *two* places to the right, as **100 × .04 = 4**

Study the following so that you will understand the above rule:

$$\begin{array}{r} .35 \\ \times 100 \\ \hline 35.00 = 35 \end{array} \qquad \begin{array}{r} 6.048 \\ \times 100 \\ \hline 604.800 = 604.8 \end{array}$$

To multiply a number like **.5** or **9.3** by **100**, think of **.5** as **.50** and **9.3** as **9.30.** Then you can easily move the decimal point two places to the right because each decimal now has two decimal places.

100 × .5 = 100 × .50 = 50

100 × 9.3 = 100 × 9.30 = 930

Multiply each decimal by 10. (Move the decimal point one place to the right.)

1. .7, .3, .9, .8, .2, .5, .1

2. .18, .34, .56, .63, .95, .87, .72

3. .184, .345, .568, .637, .954, .876

4. .084, .045, .087, .037, .063, .097

5. .0018, .0034, .0056, .0063, .0095

6. 4.019, 6.017, 8.074, 7.072, 2.085

7. 8.0004, 9.0003, 7.0006, 5.0002

8. .084, .0092, 6.34, 15.006

9. .3004, .2805, 10.05, 19.07

10. 8.029, 23.61, 16.016, 5.0074

11. .703, .609, 8.04, .804

12. 7.6, .76, .076, .0076, 1.076

Multiply each decimal by 100. (Move the decimal point two places to the right.)

1. .74, .68, .59, .82, .96, .45

2. .074, .068, .059, .082, .096, .074

3. 8.063, 2.146, 1.328, 4.679

4. .1345, .6271, .8431, .9104

5. .05, .06, .08, .01, .03, .02, .09

6. .5, .6, .8, .1, .3, .2, .9

7. 3.5, 2.6, 4.8, 5.1, 6.3, 9.2, 7.9

8. 18.3, 24.5, 31.6, 45.3, 78.2

9. .0062, .0045, .0071, .0048, .0053

10. .436, 3.6, .8, .05, .006, .09

11. .0105, .0809, .0603, .0902

12. 8.2, 9.6, .5, .05, .005

LESSON 6.

Multiplying Decimals by 1000

To multiply a whole number by **1000,** annex three zeros to the right of the number, as **1000 × 4 = 4,000.**

To multiply a decimal by **1000,** move the decimal point three places to the right, as **1000 × .035 = 35**

Study the following examples in order to understand the above rule:

$$\begin{array}{r} .354 \\ \times 1000 \\ \hline 354.000 = 354 \end{array} \qquad \begin{array}{r} .0354 \\ \times\ 1000 \\ \hline 35.4000 = 35.4 \end{array}$$

To multiply a decimal like **.03, .35, .3,** or **4.3** by **1000** think of **.03** as **.030, .35** as **.350, .3** as **.300, 4.3** as **4.300.**

Then you can more easily move the decimal point three places to the right, because each decimal now has three decimal places.

$$\begin{array}{l} 1000 \times .03 = 1000 \times\ .030 = 30 \\ 1000 \times .35 = 1000 \times\ .350 = 350 \\ 1000 \times .3\ \ = 1000 \times\ .300 = 300 \\ 1000 \times 4.3 = 1000 \times 4.300 = 4300 \end{array}$$

Multiply each number by 1000. (Move the decimal point three places to the right.)

1. .354, .493, .635, .249, .567, .827

2. .768, .342, .807, .701, .608, .903

3. .7241, .8269, .7042, .6005, .8002

4. .0632, .0234, .0603, .0208, .0705

5. .0801, .0605, .0802, .0704, .0521

6. .0023, .0065, .0038, .0071, .0032

7. .0004, .0008, .0009, .0006, .0003

8. 4.306, 5.009, 8.007, 6.009, 7.405

9. .0895, 15.065, 10.098, 10.007, 16.003

10. 3.206, 1.409, 30.006, 40.016, 5.009

11. .0907, 2.109, 3.007, 14.015, .416

12. .167, 3.098, 2.471, 1.001, 2.002

13. 2.019, .9876, .7086, 3.17865, 68.987

14. .00034, .09087, 20.863, 61.972, 87.001

15. 64.001, .89743, 6.96324, .8394, 7.098

16. 67.587, 8.7069, 539.012, .9825, 8.7

Multiply each number by 1000. (Move the decimal point three places to the right.)

1. .04, .08, .09, .07, .06, .02, .05

2. .62, .54, .81, .73, .93, .49, .16

3. .4, .3, .6, .7, .9, .8, .2, .5, .1

4. 8.1, 2.6, 4.7, 5.3, 7.2, 9.5, 3.8

5. .17, .65, .54, 5.4, 6.3, .63, .39

6. 7.8, 8.7, 9.8, 8.9, 3.7, .84, .31

7. .006, .0009, .0005, .0602, .0005

8. .0705, .0103, .607, .0804, 10.003

Give the answers orally:

9. 10 × .6 100 × .6 1000 × .6

10. 10 × .35 100 × .35 1000 × .35

11. 10 × .035 100 × .035 1000 × .035

12. 10 × 6.4 100 × 6.4 1000 × 6.4

13. 10 × .065 100 × .75 1000 × .879

14. 10 × 70.9 100 × 8.97 1000 × .1486

15. 10 × 56.01 100 × 9.567 1000 × .987

LESSON 7.

Dividing a Decimal by a Whole Number

How to divide when the
Divisor is an integer (whole number)
Dividend is a decimal or a mixed decimal.

Compare the following:

A. Divide $\frac{6}{10}$ by **2**

$$\frac{6}{10} \div \frac{2}{1}$$

$$\frac{\overset{3}{\cancel{6}}}{10} \times \frac{1}{\underset{1}{\cancel{2}}} = \frac{3}{10}$$

Divide **.6** by **2**

$$.6 \div 2$$

$$\begin{array}{r} .3 \\ 2\overline{)\ .6} \end{array}$$

B. Divide $\frac{39}{100}$ by **3**

$$\frac{39}{100} \div \frac{3}{1}$$

$$\frac{\overset{13}{\cancel{39}}}{100} \times \frac{1}{\underset{1}{\cancel{3}}} = \frac{13}{100}$$

Divide **.39** by **3**

$$.39 \div 3$$

$$\begin{array}{r} .13 \\ 3\overline{).39} \end{array}$$

When the divisor is an integer and the dividend is a decimal or a mixed decimal, place the decimal point in the quotient directly above the decimal point in the dividend.

C. Divide $\frac{32}{100}$ by **8**

$$\frac{32}{100} \div \frac{8}{1}$$

$$\frac{\overset{4}{\cancel{32}}}{100} \times \frac{1}{\underset{1}{\cancel{8}}} = \frac{4}{100}$$

Divide **.32** by **8**

$$.32 \div 8$$

$$\begin{array}{r} .04 \\ 8\overline{).32} \end{array}$$

Zero is needed in tenths' place to show there are no tenths.

D. Divide $\frac{245}{1000}$ by **7**

$$\frac{245}{1000} \div \frac{7}{1}$$

$$\frac{\overset{35}{\cancel{245}}}{1000} \times \frac{1}{\underset{1}{\cancel{7}}} = \frac{35}{1000}$$

Divide **.245** by **7**

$$.245 \div 7$$

$$\begin{array}{r} .035 \\ 7\overline{).245} \end{array}$$

Zero is needed in tenths' place to show there are no tenths.

Place the decimal point in the quotient first, and then divide:

1.	.8 by 4 = .2	.48 by 4	.575 by 5
2.	.9 by 3	.36 by 2	.475 by 5
3.	.6 by 3	.84 by 4	.847 by 7
4.	.8 by 2	.48 by 3	.568 by 4
5.	.4 by 2	.76 by 4	.356 by 2
6.	3.2 by 2	.98 by 7	.964 by 4
7.	5.6 by 4	.85 by 5	.852 by 6
8.	9.1 by 7	.75 by 5	.992 by 8

Solve:

1. Find the quotient when the dividend is .456 and the divisor is 4.
2. What is the quotient when .282 is divided by 6?

Place the decimal point in the quotient first, and then divide:

1.	.63 by 9	.427 by 7	.664 by 8
2.	.35 by 7	.828 by 9	.308 by 7
3.	.16 by 4	.656 by 8	.348 by 6
4.	.81 by 9	.432 by 6	.375 by 5
5.	.24 by 8	.441 by 7	.306 by 9
6.	.36 by 6	.348 by 4	.595 by 7
7.	.54 by 6	.425 by 5	.392 by 4
8.	.49 by 7	.558 by 6	.208 by 8
9.	.63 by 9	.387 by 9	.351 by 9
10.	.72 by 8	.448 by 8	.204 by 6

Solve:

1. Find the quotient when the divisor is 8 and the dividend is .736
2. The dividend is .595; the divisor is 7; what is the quotient?

LESSON 8.

Dividing a Mixed Number by a Whole Number

A. $10.32 \div 6$ $\qquad \begin{array}{r} 1.72 \\ 6\overline{)10.32} \end{array}$

B. $24.56 \div 8$ $\qquad \begin{array}{r} 3.07 \\ 8\overline{)24.56} \end{array}$

C. $32.016 \div 4$ $\qquad \begin{array}{r} 8.004 \\ 4\overline{)32.016} \end{array}$

D. $45.5015 \div 5$ $\qquad \begin{array}{r} 9.1003 \\ 5\overline{)45.5015} \end{array}$

E. $\$72.18 \div 6$ $\qquad \begin{array}{r} \$12.03 \\ 6\overline{)\$72.18} \end{array}$

Divide:

1. $\overset{1.22}{9\overline{)10.98}}$ $\quad 9\overline{)36.27}$ $\quad 9\overline{)45.81}$

2. $8\overline{)56.016}$ $\quad 7\overline{)49.035}$ $\quad 6\overline{)24.030}$

3. $5\overline{)35.5020}$ $\quad 5\overline{)15.5035}$ $\quad 4\overline{)24.8028}$

4. $6\overline{)9.66}$ $\quad 7\overline{)15.54}$ $\quad 8\overline{)43.36}$

5. $9\overline{)27.18}$ $\quad 8\overline{)40.32}$ $\quad 7\overline{)21.35}$

6. $3\overline{)21.024}$ $\quad 4\overline{)36.032}$ $\quad 5\overline{)35.025}$

7. $6\overline{)42.6036}$ $\quad 7\overline{)49.7021}$ $\quad 8\overline{)64.8040}$

8. $6\overline{)\$36.12}$ $\quad 7\overline{)\$42.21}$ $\quad 8\overline{)\$48.24}$

9. $9\overline{)\$81.36}$ $\quad 6\overline{)\$54.30}$ $\quad 5\overline{)\$20.25}$

10. $4\overline{)\$16.32}$ $\quad 8\overline{)\$40.72}$ $\quad 9\overline{)\$63.27}$

11. $8\overline{)11.52}$ $\quad 9\overline{)20.97}$ $\quad 7\overline{)35.049}$

12. $6\overline{)48.6018}$ $\quad 7\overline{)56.7049}$ $\quad 5\overline{)\$30.35}$

Divide:

1. $96\overline{)23.04}$ $\quad 84\overline{)26.88}$ $\quad 75\overline{)15.75}$

2. $64\overline{)19.20}$ $\quad 55\overline{)11.55}$ $\quad 84\overline{)35.28}$

3. $45\overline{)90.135}$ $\quad 37\overline{)37.185}$ $\quad 53\overline{)15.9318}$

4. $26\overline{)54.86}$ $\quad 31\overline{)72.85}$ $\quad 49\overline{)61.74}$

5. $35\overline{)70.35}$ $\quad 14\overline{)73.50}$ $\quad 52\overline{)66.56}$

6. $33\overline{)46.20}$ $\quad 25\overline{)79.50}$ $\quad 16\overline{)64.96}$

7. $27\overline{)\$325.35}$ $\quad 43\overline{)\$475.58}$ $\quad 35\overline{)\$457.80}$

8. $75\overline{)\$51.75}$ $\quad 24\overline{)\$48.24}$ $\quad 27\overline{)\$48.87}$

9. $25\overline{)30.0075}$ $\quad 16\overline{)36.8016}$ $\quad 34\overline{)78.2170}$

10. $42\overline{)42.126}$ $\quad 53\overline{)10.6265}$ $\quad 28\overline{)11.2084}$

11. $4\overline{)39.68}$ $\quad 7\overline{)64.82}$ $\quad 9\overline{)87.39}$

12. $6\overline{)\$36.42}$ $\quad 5\overline{)\$43.55}$ $\quad 8\overline{)\$57.68}$

Solve the following:

1. When Mrs. Blanch bought a frigidaire for $334.80 she paid for it in 12 monthly payments. How much did she pay each month?

2. Mr. Enley earns an annual salary of $4824. Find his monthly salary.

3. If it requires 11 qt. of milk to produce one pound of butter, how many pounds of butter can be obtained from 156.2 gallons of milk?

4. A farmer grew 42,262.5 pounds of tomatoes. How many truckloads of tomatoes did he ship if each truck held about 525 pounds?

More Work With Mixed Decimals

A.	**B.**	**C.**	**D.**	**E.**
$131.75 \div 25$	$13.175 \div 25$	$1.3175 \div 25$	$2.10254 \div 418$	$.38786 \div 43$
$\begin{array}{r} 5.27 \\ 25\overline{)131.75} \end{array}$	$\begin{array}{r} .527 \\ 25\overline{)13.175} \end{array}$	$\begin{array}{r} .0527 \\ 25\overline{)1.3175} \end{array}$	$\begin{array}{r} .00503 \\ 418\overline{)2.10254} \end{array}$	$\begin{array}{r} .00902 \\ 43\overline{).38786} \end{array}$

Place the decimal point in the quotient, and then divide:

1. $56\overline{)132.72}$ $34\overline{)20.842}$ $42\overline{)2.6544}$

2. $37\overline{)156.51}$ $62\overline{)386.88}$ $72\overline{)57.312}$

3. $85\overline{)2.3375}$ $216\overline{)1.60272}$ $58\overline{)442.54}$

4. $35\overline{)28.875}$ $57\overline{)1.3965}$ $43\overline{)38.786}$

5. $325\overline{)7.95925}$ $87\overline{)369.75}$ $76\overline{)20.976}$

6. $54\overline{)343.44}$ $36\overline{)13.932}$ $63\overline{)2.8791}$

7. $275\overline{)1.94975}$ $74\overline{)323.38}$ $86\overline{)78.174}$

8. $49\overline{)2.4892}$ $239\overline{)1.45073}$ $89\overline{)758.28}$

9. $78\overline{)31.434}$ $59\overline{)2.5783}$ $423\overline{)3.10482}$

10. $56\overline{)241.92}$ $94\overline{)50.196}$ $92\overline{)62.836}$

Place the decimal point in the quotient, and then divide:

1. $74\overline{).41662}$ $76\overline{).14668}$ $79\overline{).39026}$

2. $83\overline{).33366}$ $85\overline{).18275}$ $89\overline{).45657}$

3. $94\overline{)12.22}$ $7\overline{)14.021}$ $5\overline{)35.6015}$

4. $23\overline{)62.79}$ $9\overline{)36.72}$ $6\overline{)42.012}$

5. $6\overline{)54.18}$ $5\overline{)10.80}$ $34\overline{)4.488}$

6. $62\overline{)1.9468}$ $52\overline{).10608}$ $318\overline{)1.59954}$

7. $8\overline{)\$64.24}$ $9\overline{)45.027}$ $45\overline{)28.530}$

8. $9\overline{)63.45}$ $7\overline{)42.5047}$ $32\overline{)1.1648}$

9. $547\overline{)4.17908}$ $70\overline{).38360}$ $8\overline{)72.16}$

10. $55\overline{)2.7115}$ $49\overline{)31.213}$ $932\overline{)4.35244}$

Solve the following:

1. A 37-day round trip from San Francisco to Manila cost $1082.25. What was the expense for one day of the trip?

2. If Mrs. Phelan's milk bill for five weeks amounted to $36.75, what was the bill for one day?

3. A fast train runs from New York to a station 1069.2 miles distant in 27 hours. What is the average speed of the train?

4. A rug for the floor of the sanctuary measures 54 sq. yd. If the rug costs $309.96, how much is this per square yard?

5. Over a period of 15 days the tax collector in our town collected $13,106.25. What were his average daily collections?

More Problems to Solve

1. A piece of wire 303.6 feet long is to be divided into 44 pieces of equal length. How long will each piece be? 6.9

2. If the weight of 25 turkeys is 458.75 pounds, what is the average weight of one turkey? 18.35

3. A certain plane flew 5791.5 miles in 27 hours. What was its speed per hour? 214.5

4. Mr. Gans sold a 65 acre lot for $4907.50. What did he receive per acre? $75.50

5. George should have divided 323.84 by 64, but by mistake he divided 32384 by 64. What was the difference between the two answers? 506.94

6. When 59 tons of wheat can be bought for $1843.75, what is the price per ton? $31.25

7. Mr. Dillon shipped 65 cartons of merchandise by freight. If the total weight of the cartons was 6776.25 pounds, what was the average weight of a carton? 104.25

8. If a dealer paid $33.75 for 45 ties, what was the cost per tie? .75

9. Tom weighs 70.4 pounds. John is 18 pounds lighter. What is John's weight? 52.4

10. What number is .01 less than 5.09? 5.08

11. If John takes 73 steps to go 127.75 feet, what is the length of his step? 1.75

12. If 85 yards of material cost $63.75, what is the price per yard? .75

13. A certain street consists of 34 houses each having a frontage of 9.75 yards. How long is the street? 331.5

14. If 305.25 ounces of cake are to be served equally to 37 children, how many ounces will each child receive?

15. A farmer had 182.56 bushels of corn which he put into 56 sacks. How much did each sack hold?

16. What is the speed per hour of an automobile, if it goes 1818.0 mi. in 3.6 hours?

17. What number is .1 less than 5.09?

18. How much must be added to 9 times .05 to make 2.3?

19. How many times is an angle of 8 degrees contained in an angle of 36.8 degrees?

20. If a flock of 85 sheep is sold for $215.05, what is the average price per sheep?

21. Caution signs were erected every 1.4 miles along a highway that extended for 51.8 miles. How many signals were erected?

22. The total weight of the 23 members of a school bowling team is 3139.5 pounds. What is the average weight of the team?

23. A girl scout troop collected $87.50 by selling cookies. If each box of cookies cost $.35 how many boxes did they sell?

24. Allowing 9.6 inches for each plant how many rose bushes can be planted in a straight row along a garden path 8 feet long?

25. In a western city the total rainfall during the month of May was 24.18 inches. What was the average rainfall each day?

26. Tom divided 152.32 by 3.2 and got 32. for an answer. Was Tom's answer correct?

In dividing a number such as $.4\overline{)12}$, we see that the *divisor* contains *tenths* and the dividend is a *whole number*.

If the *divisor* contains *tenths*, the *dividend* must also contain *tenths*.

Therefore in the example $4\overline{)12}$, a decimal point and a zero must be placed to the right of the whole number. Then **12** becomes **12.0**, and the example is $.4\overline{)12.0}$.

If the *divisor* contains *hundredths*, the *dividend* must contain *hundredths*.

If the *divisor* contains *thousandths*, the *dividend* must contain *thousandths*.

$.08\overline{)32}$ becomes $.08\overline{)32.00}$ $.024\overline{)48}$ becomes $.024\overline{)48.000}$

This shows us that our first step is to make sure that there are *as many decimal places in the dividend as there are in the divisor.*

LESSON 9.

Equalizing Decimal Places

Make the dividend have as many decimal places as the divisor.

1. $.6\overline{)12}$ $.06\overline{)24}$ $.006\overline{)36}$
2. $.5\overline{)45}$ $.08\overline{)56}$ $.004\overline{)8}$
3. $.8\overline{)24}$ $.07\overline{)63}$ $.008\overline{)48}$
4. $.9\overline{)27}$ $.09\overline{)72}$ $.002\overline{)6}$
5. $.3\overline{)21}$ $.04\overline{)68}$ $.003\overline{)9}$
6. $.2\overline{)16}$ $.14\overline{)56}$ $.003\overline{)6}$
7. $.4\overline{)28}$ $.12\overline{)48}$ $.023\overline{)46}$
8. $.7\overline{)35}$ $.16\overline{)60}$ $.032\overline{)64}$

Make the dividend have as many decimal places as the divisor.

1. $.36\overline{)18}$ $3.6\overline{)18}$ $.036\overline{)18}$
2. $.48\overline{)24}$ $.048\overline{)24}$ $4.8\overline{)24}$
3. $.124\overline{)31}$ $2.25\overline{)99}$ $.006\overline{)36}$
4. $.365\overline{)9125.}$ $1.25\overline{)40}$ $10.6\overline{)212}$
5. $.216\overline{)54}$ $2.08\overline{)52}$ $3.18\overline{)159}$
6. $.108\overline{)27}$ $1.24\overline{)93}$ $31.5\overline{)189}$
7. $.104\overline{)78}$ $1.08\overline{)81}$ $.009\overline{)162}$
8. $.302\overline{)453}$ $21.6\overline{)108}$ $.016\overline{)128}$

To make **.8** a whole number, multiply it by **10**. Move the decimal point one place to the right. **.8** × **10** becomes $\underset{\curvearrowright}{.8.}$ or **8**.

To make **.08** a whole number, multiply it by **100**. Move the decimal point two places to the right. **.08** × **100** = $\underset{\curvearrowright}{.08.}$ or **8**.

To make **.008** a whole number multiply it by **1000**. Move the decimal point three places to the right. **.008** × **1000** = $\underset{\curvearrowright}{.008.}$ or **8**.

Make the following decimals whole numbers by multiplying by 10, 100, and 1000.

1. .3, .2, .5, .4, .6, .1, .7, .9
2. .06, .08, .09, .03, .04, .08, .02
3. .005, .007, .004, .009, .006, .003
4. .025, .038, .164, .35, .42, .63
5. .37, .037, .8, .67, .675, .16, .168

LESSON 10.

Moving the Decimal Point

We have learned how to divide a decimal by a whole number, now we are learning how to divide a whole number by a decimal such as $.3\overline{)6}$. We know the first thing to do is:

Step 1.—Make sure that the dividend contains as many decimal places as the divisor. As $.3\overline{)6.0}$

Step 2.—Make the *divisor* a whole number by moving the decimal point the required number of places to the right. Move the decimal point in the *dividend* the same number of places to the right as it has been moved in the divisor. Place the decimal point in the *quotient* directly above the decimal point in the dividend.

Note the same quotient in (a) and (b)	
(a) $\begin{array}{r}2\\3\overline{)6}\end{array}$	(a) $.3\overline{)6.0} = .3_{\curvearrowright}\overline{)6.0_{\curvearrowright}} = \begin{array}{r}20\\3\overline{)60}\end{array}$
(b) $10\times3=30$ $10\times6=60$ $\begin{array}{r}2\\30\overline{)60}\end{array}$	(b) $10\times.3=3$ $10\times6=60$ $\begin{array}{r}20\\3\overline{)60}\end{array}$
Divisor and dividend in (a) have been multiplied by **10** in (b) Quotients in (a) and (b) are the same.	

In the following examples see that there are as many decimal places in the dividend as there are in the divisor. Move the decimal point in the divisor and in the dividend, and place it in the quotient as shown at the top of column 2.

1. $.4\overline{)8.0}$ $.9\overline{)18.0}$ $.6\overline{)36.0}$ $.8\overline{)32.0}$

2. $.02\overline{)16.00}$ $.05\overline{)25.0}$ $.07\overline{)21.00}$

3. $.003\overline{)12.000}$ $.004\overline{)24.000}$ $.009\overline{)18.000}$

4. $.23\overline{)46.00}$ $.48\overline{)96.00}$ $.34\overline{)68.00}$

Study these examples:

	Before moving	After moving
$.3\overline{)12.0}$	$.3_{\curvearrowright}\overline{)12.0_{\curvearrowright}}$	$3\overline{)120.}$
$.03\overline{)12.00}$	$.03_{\curvearrowright}\overline{)12.00_{\curvearrowright}}$	$3\overline{)1200.}$
$.003\overline{)12.000}$	$.003_{\curvearrowright}\overline{)12.000_{\curvearrowright}}$	$3\overline{)12000.}$

There are three important things to do with the decimal point:

1. Move the decimal point in the divisor the required number of places to the right to make it a whole number.

2. Move the decimal point in the dividend the same number of places as it has been moved in the divisor.

3. Place the decimal point in the quotient directly above the decimal point in the dividend.

Follow the steps given above and divide:

1. $.24\overline{)12.00}$ $.35\overline{)10.50}$ $3.2\overline{)16.0}$

2. $8.2\overline{)41.0}$ $.45\overline{)27.00}$ $6.1\overline{)243.0}$

3. $3.16\overline{)948.00}$ $5.06\overline{)253.00}$ $.345\overline{)69.000}$

4. ✓ $.9\overline{)72.0}$ $.91\overline{)546.00}$ $.307\overline{)614.000}$

5. ✓ $8.5\overline{)51.0}$ $.85\overline{)51.00}$ $.085\overline{)51.000}$

6. ✓ $.095\overline{)76.000}$ $9.5\overline{)76.0}$ $.95\overline{)76.00}$

7. $.46\overline{)23.00}$ $4.6\overline{)23.0}$ $.126\overline{)63.000}$

8. $1.4\overline{)112.0}$ $.14\overline{)112.00}$ $.014\overline{)112.000}$

Equalize the decimal places:

1. $.15\overline{)225}$ $3.2\overline{)640}$ $.16\overline{)800}$

2. $.045\overline{)\ 3.5}$ $.63\overline{)12.6}$ $2.5\overline{)75}$

3. $.19\overline{)570}$ $1.9\overline{)950}$ $2.7\overline{)243}$

LESSON 11.

Dividing a Whole Number by a Decimal

Study the following: Divide 42 by .6

$.6\overline{)42}$ Step 1—See if the dividend has as many decimal places as the divisor.

$.6\overline{)42.0}$ Step 2—Make the number of decimal places in the dividend equal to the number of decimal places in the divisor.

$\begin{array}{r} . \\ .6.\overline{)42.0.} \end{array}$ Step 3—Move the decimal point in the divisor the required number of places to the right to make it a whole number.
Move the decimal point in the dividend the same number of places.
Place the decimal point in the quotient directly above the decimal point in the dividend.

$\begin{array}{r} 70. \\ 6\overline{)420.} \end{array}$ Step 4—Divide as you do in whole numbers.

In the following, some dividends have the correct number of decimal places, others need more. Make the necessary corrections:

1. $.6\overline{)12.0}$ $.08\overline{)32.00}$ $.306\overline{)153.0}$
2. $.8\overline{)24}$ $.16\overline{)64.0}$ $20.4\overline{)408.0}$
3. $.7\overline{)56}$ $.32\overline{)96.00}$ $6.03\overline{)1809}$
4. $.9\overline{)54.0}$ $.16\overline{)48.0}$ $.152\overline{)304.00}$
5. $.3\overline{)39}$ $.005\overline{)10.0}$ $9.05\overline{)362.0}$

Follow the steps given above and divide:

1. $.6\overline{)12}$ $.06\overline{)12}$ $.006\overline{)12}$
2. $.8\overline{)56}$ $.08\overline{)56}$ $.008\overline{)56}$
3. $.7\overline{)63}$ $.07\overline{)63}$ $.007\overline{)63}$
4. $.5\overline{)45}$ $.05\overline{)45}$ $.005\overline{)45}$
5. $.9\overline{)72}$ $.09\overline{)72}$ $.009\overline{)72}$
6. $.4\overline{)64}$ $.04\overline{)64}$ $.004\overline{)64}$
7. $.12\overline{)48}$ $.012\overline{)48}$ $.002\overline{)48}$

Follow the steps given above and divide:

1. $.36\overline{)18}$ $3.6\overline{)18}$ $.036\overline{)18}$
2. $.48\overline{)24}$ $.048\overline{)24}$ $4.8\overline{)24}$
3. $.124\overline{)31}$ $65\overline{)91}$ $.216\overline{)54}$
4. $.108\overline{)27}$ $1.24\overline{)93}$ $2.08\overline{)52}$
5. $3.18\overline{)159}$ $.108\overline{)27}$ $.104\overline{)78}$
6. $.302\overline{)453}$ $.406\overline{)203}$ $.305\overline{)488}$
7. $42.5\overline{)102}$ $30.5\overline{)122}$ $21.6\overline{)108}$
8. $.016\overline{)128}$ $.009\overline{)162}$ $1.08\overline{)81}$
9. $31.5\overline{)189}$ $31.8\overline{)159}$ $1.06\overline{)212}$
10. $.16\overline{)80}$ $.28\overline{)14}$ $.032\overline{)64}$
11. $.023\overline{)46}$ $.009\overline{)63}$ $.152\overline{)760}$
12. $.014\overline{)112}$ $1.26\overline{)65}$ $.95\overline{)76}$
13. $9.5\overline{)76}$ $8.5\overline{)51}$ $.91\overline{)546}$

LESSON 12.

Dividing a Decimal by a Decimal

Note:

If there is an insufficient number of decimal places in the dividend, zero or zeros are needed.

A.

$$.003\overline{).12} = \underset{\smile}{.003.}\overline{)\underset{\smile}{.120.}} = 3\overset{40.}{\overline{)120.}} = 40$$

B.

$$.002\overline{)8.4} = \underset{\smile}{.002.}\overline{)\underset{\smile}{8.400.}} = 2\overset{4200.}{\overline{)8400.}} = 4200$$

Can you explain each step in the above examples?

Divide:

1. $.03\overline{).6}$ $.04\overline{).8}$ $.09\overline{)1.8}$
2. $.06\overline{)3.6}$ $.07\overline{)5.6}$ $.08\overline{)6.4}$
3. $.05\overline{)1.5}$ $.03\overline{)2.4}$ $.02\overline{)1.8}$
4. $.003\overline{)10.5}$ $.002\overline{)5.6}$ $.004\overline{)1.28}$
5. $.009\overline{)18.9}$ $.007\overline{)21.7}$ $.006\overline{)1.92}$
6. $.012\overline{)25.2}$ $.013\overline{)40.3}$ $.007\overline{)1.26}$
7. $.016\overline{)97.6}$ $.014\overline{)86.8}$ $.004\overline{)8.68}$
8. $.123\overline{)4.92}$ $.121\overline{)3.63}$ $.134\overline{)5.36}$
9. $.215\overline{)12.9}$ $.018\overline{)5.58}$ $.102\overline{)61.2}$
10. $.062\overline{)2.48}$ $.203\overline{)8.12}$ $.407\overline{)81.4}$
11. The divisor is .024, the dividend is .48, what is the quotient?
12. What is the quotient when .08 is divided by .008?

Note:

The dividend has as many decimal places as the divisor. The dividend has more decimal places than the divisor.

A.

$$.03\overline{)3.24} = 3\overset{108.}{\overline{)324.}} = 108$$

B.

$$.04\overline{).0032} = 4\overset{.08}{\overline{).32}} = .08$$

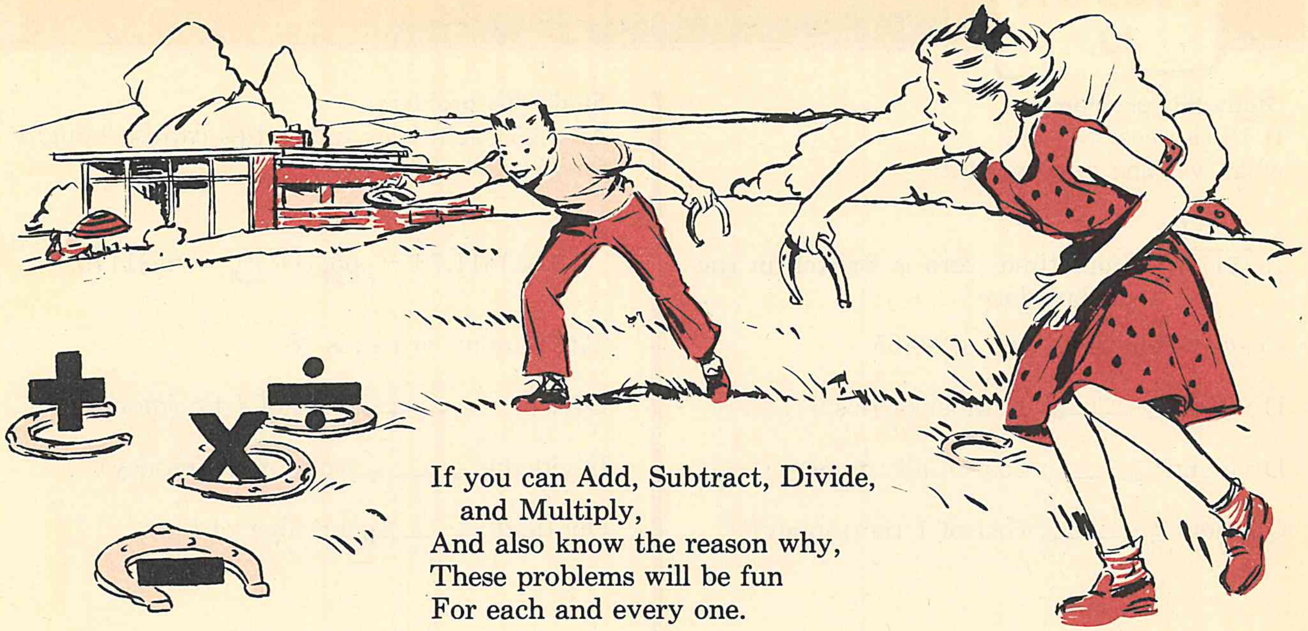
C.

$$.002\overline{).0008} = 2\overset{.4}{\overline{).8}} = .4$$

The dividend may have more, but never fewer decimal places than the divisor.

Divide:

1. $.5\overline{)42.5}$ $.09\overline{)3.87}$ $2.3\overline{)96.6}$
2. $.7\overline{).049}$ $.07\overline{).049}$ $.32\overline{).064}$
3. $.6\overline{).048}$ $.06\overline{).822}$ $.7\overline{).217}$
4. $.8\overline{).056}$ $.05\overline{).035}$ $.8\overline{)6.48}$
5. $.9\overline{)18.09}$ $.07\overline{).021}$ $.008\overline{).0016}$
6. $.3\overline{).006}$ $.08\overline{).064}$ $.004\overline{).0032}$
7. $.6\overline{).018}$ $.05\overline{).015}$ $.005\overline{).0045}$
8. $.5\overline{).035}$ $.08\overline{)1.92}$ $.003\overline{).0024}$
9. $.4\overline{).036}$ $.07\overline{).364}$ $.007\overline{).0063}$
10. $.8\overline{).072}$ $.04\overline{)8.16}$ $.009\overline{).063}$
11. What is the quotient when .009 is divided by .03?
12. The divisor is .5, the dividend is 25; what is the quotient?



If you can Add, Subtract, Divide,
  and Multiply,
And also know the reason why,
These problems will be fun
For each and every one.

Problems Involving Decimals

Solve:

1. On January 31, 1951, Captain Charles Blair broke all records for a flight from New York to London. What was his average speed if the time was 7.8 hours, and the distance, about 3510 miles? 450 m.p.h.

7.8⟌3510

2. Mr. Blake used 1.75 gallons of gasoline to go 25 miles in his automobile. What decimal part of a gallon did he use to go 1 mi.? .07 gal.

3. Tom divided 3.45 by .05 instead of 3.45 by .5. By how much was his answer incorrect? (Subtract quotients) 62.1

4. If a train goes 161 miles in 3.5 hours, what is its average speed per hour? 46 m.p.h.

3.5⟌161

5. How many pieces of wood 3.5 feet long can be cut from a piece 21 feet long? 6 pieces

3.5⟌21

6. If a bird flies 13.5 miles in 15 minutes, how far can he fly in 1 minute? .9 mi.

15⟌13.5

7. If the divisor is .005 and the dividend is 45, what is the quotient? 9000

.005⟌45

8. If Dan's step is 2.75 feet long, how many steps will he take in going 77 feet? 28

9. What number multiplied by .106 will give 3.71 for a product? 35

10. If 11.5 ounces of cake are allowed for each child, how many children at the school party can be served from 276 ounces of cake? 24

11. During March of this year, 77,285 passengers were flown to Miami by the Eastern Air Lines. During the same month last year, there were about .8 of this number. What number of passengers were flown last year? 61828

12. By what decimal must .0315 be divided to give the quotient 4.5? .007

13. By what decimal must 36.05 be multiplied to give the product .2163? .006

14. A bus averaging 31.4 miles per hour, traveled 157 miles. How many hours did it take the bus to travel that distance? 5 hr.

LESSON 13. United States Money in Decimals

Study this problem:
If 18 ties cost $11.70,
what was the price per tie?

$$\begin{array}{r}\$\ 0.65\\ 18\overline{)\$11.70}\end{array}$$

Sometimes zero is written in the dollar place.

Cost of each tie is $.65 or $0.65

Divisor $= \longrightarrow$ number of ties

Dividend $= \longrightarrow$ cost of all (money)

Quotient $= \longrightarrow$ cost of 1 tie (money)

Study this problem:
At $.65 each, how many ties can be bought for $11.70?

$$\$.65\overline{)\$11.70} = .\underset{\curvearrowright}{65}\overline{)11.\underset{\curvearrowright}{70}} = \begin{array}{r}18.\\ 65\overline{)1170.}\end{array}$$

The number of ties is 18

Divisor $= \longrightarrow$ cost of 1 tie (money)

Dividend $= \longrightarrow$ cost of all (money)

Quotient $= \longrightarrow$ number of ties.

Solve:

1. If the wholesale price of a certain kind of pencil is $5.40 a gross, what is the price per dozen?

2. With his salary and commission John was able to earn $72.60 in five days. How much did he earn in one day?

3. A piece of material containing 6 yards was purchased for $10.50. This was how much per yard?

4. Find the cost of one bus ticket if a book of 25 tickets can be purchased for $4.75.

5. Mr. McCollum is able to save $390 a year from his salary. How much does he save in one month?

6. The bill for laying a cement driveway was $112.50. If it cost $1.25 a sq. yd., how many square yards of cement were in the driveway?

7. Father Byrne divided $5.25 among the altar boys giving each boy $.35. How many boys were there?

8. Our class in school collected $47.60 for rosaries to send to the men in the service. How many rosaries could they purchase at $.20 a pair?

9. How long will it take to pay for a television set bought on the installment plan for $450, if the monthly payments amount to $25?

10. Joe's father received $420.74 for wheat which he sold at $1.09 a bushel. How many bushels did he sell?

11. Mr. Brown paid a group of boys $12.60 for helping him on his farm. If he gave each boy $2.10, how many boys were in the group?

12. In one hour at the circus all the balloons were sold at $.15 apiece. If the man took in $20.25, how many balloons were sold?

13. In the year 1951 the total collection of taxes from 251 boroughs of a certain city was $2,646,255.35. This was an average of how much from each borough?

Further Division With Decimals

Study the following: —Divide (**A**) 5 by .4 (**B**) 3 by .8 (**C**) 3 by .32

A. $.4\overline{)5.0} = \underset{\curvearrowright}{.4.}\overline{)\underset{\curvearrowright}{5.0.}} = \begin{array}{r}12.5\\4\overline{)50.0}\end{array}$

B. $.8\overline{)3.0} = \underset{\curvearrowright}{.8.}\overline{)\underset{\curvearrowright}{3.0.}} = \begin{array}{r}3.75\\8\overline{)30.00}\end{array}$

C. $.32\overline{)3.00} = \underset{\curvearrowright}{.32.}\overline{)\underset{\curvearrowright}{3.00.}} = \begin{array}{r}9.375\\.32\overline{)300.000}\end{array}$

Note that in order to complete the division:

In **A.** an additional zero had to be annexed after the decimal point in the dividend.

In **B.** two additional zeros had to be annexed in the dividend after the decimal point.

In **C.** three additional zeros had to be annexed in the dividend after the decimal point.

Divide and complete the division:

1.	$.4\overline{)9}$	$.4\overline{)1.8}$	$.005\overline{).006}$
2.	$.5\overline{)6}$	$.16\overline{)3}$	$.016\overline{).03}$
3.	$.16\overline{).6}$	$.08\overline{).3}$	$.016\overline{).06}$
4.	$.5\overline{)9}$	$2.5\overline{)8}$	$.004\overline{).018}$
5.	$.8\overline{)1}$	$3.5\overline{)5.6}$	$.32\overline{).8}$
6.	$.5\overline{).8}$	$1.2\overline{)1.8}$	$3.2\overline{).8}$
7.	$4\overline{)1.9}$	$1.2\overline{).18}$	$3.2\overline{).4}$
8.	$.8\overline{).5}$	$.15\overline{)1.8}$	$1.5\overline{)7.2}$
9.	$.8\overline{).3}$	$3.2\overline{).12}$	$4.5\overline{).72}$
10.	$.5\overline{).7}$	$3.2\overline{).4}$	$32\overline{).3}$
11.	$.04\overline{).6}$	$.004\overline{).17}$	$.004\overline{)1.7}$
12.	$.04\overline{).5}$	$3.2\overline{)2.4}$	$3.2\overline{)20}$
13.	$.6\overline{).9}$	$.05\overline{).12}$	$.16\overline{).5}$
14.	$.6\overline{)1.5}$	$.05\overline{)2.4}$	$.16\overline{).7}$

Solve:

1. For the Mother-Daughter Banquet the Girl Scouts turned in $165.55 for 301 tickets. What was the price of each ticket?

.55

2. What is the speed per hour of an airplane that covers a distance of 2375 miles in 9.5 hours? 250 m. p. h.

3. A B-29 used 234.9 gallons of gas during a trip of 5.8 hours. How many gallons were used per hour? 40.5 gal.

4. In going to and from school for 5 school days our bus travels 172 miles. How many miles does it cover each day? 34.4 mi.

5. The Boy Scouts hiked 12.37 miles in 4.5 hours. How many miles did they hike in one hour? 2.74 8/9 mi.

6. If one box holds 1.6 lb. of macaroni salad, how many boxes must a store use for 108 pounds? 67.5 boxes

7. In an air race one plane flew 3477.6 miles in 12.6 hours. Find the average speed per hour of this plane.

276 m. p. h.

LESSON 15.

Decimal Equivalents of Fractions

A fraction always expresses division.
The numerator is the dividend.
The denominator is the divisor.

$\frac{12}{3} = 4 \qquad \frac{20}{4} = 5 \qquad \frac{24}{3} = 8$, etc.

In such fractions, the quotient is a whole number, and it can be easily found. In a fraction such as $\frac{3}{4}$, the numerator "**3**" is the dividend. The denominator "**4**" is the divisor.

$\frac{3}{4} = 4\overset{.75}{\overline{)3.00}}$ The quotient is **.75**

Therefore $\frac{3}{4}$ and **.75** have the same value.

To change a fraction to a decimal.

1. To the right of the numerator, place a decimal point followed by as many zeros as are needed to start the division.
2. In the quotient, place the decimal point directly above the decimal point in the dividend.
3. Divide, and add more zeros as they are needed.

$\frac{3}{25} = 25\overset{.12}{\overline{)3.00}}$

$\frac{3}{25} = .12$

$\frac{1}{16} = 16\overset{.0625}{\overline{)1.0000}}$

$\frac{1}{16} = .0625$

Change to decimal equivalents:

1. $\frac{1}{16} \quad \frac{3}{16} \quad \frac{5}{16} \quad \frac{7}{16} \quad \frac{9}{16} \quad \frac{11}{16} \quad \frac{13}{16} \quad \frac{15}{16}$

2. $\frac{1}{20} \quad \frac{3}{20} \quad \frac{7}{20} \quad \frac{9}{20} \quad \frac{11}{20} \quad \frac{13}{20} \quad \frac{17}{20} \quad \frac{19}{20}$

3. $\frac{2}{25} \quad \frac{3}{25} \quad \frac{4}{25} \quad \frac{6}{25} \quad \frac{7}{25} \quad \frac{8}{25} \quad \frac{9}{25} \quad \frac{11}{25}$

4. $\frac{1}{40} \quad \frac{3}{40} \quad \frac{7}{40} \quad \frac{9}{40} \quad \frac{11}{40} \quad \frac{13}{40} \quad \frac{17}{40} \quad \frac{19}{40}$

5. $\frac{1}{8} \quad \frac{3}{8} \quad \frac{5}{8} \quad \frac{7}{8} \quad \frac{12}{25} \quad \frac{13}{25} \quad \frac{17}{25} \quad \frac{21}{25}$

Change to decimal equivalents:

6. $\frac{21}{40} \quad \frac{23}{40} \quad \frac{31}{40} \quad \frac{27}{40} \quad \frac{1}{32} \quad \frac{3}{32} \quad \frac{5}{32} \quad \frac{7}{32}$

7. $\frac{9}{32} \quad \frac{11}{32} \quad \frac{13}{32} \quad \frac{15}{32} \quad \frac{19}{32} \quad \frac{1}{80} \quad \frac{7}{80} \quad \frac{9}{80}$

8. $\frac{1}{50} \quad \frac{3}{50} \quad \frac{7}{50} \quad \frac{9}{50} \quad \frac{11}{50} \quad \frac{13}{50} \quad \frac{17}{50} \quad \frac{19}{50}$

9. $\frac{13}{120} \quad \frac{17}{120} \quad \frac{19}{120} \quad \frac{29}{120} \quad \frac{37}{120} \quad \frac{41}{120} \quad \frac{43}{120}$

10. $\frac{1}{125} \quad \frac{3}{125} \quad \frac{7}{125} \quad \frac{7}{60} \quad \frac{13}{60} \quad \frac{19}{60} \quad \frac{23}{60}$

Study the following:

A.

$\frac{1}{9} = 9\overset{.1111\frac{1}{9}}{\overline{)1.0000}}$

$\frac{1}{9} = .1\frac{1}{9}$ or $.11\frac{1}{9}$ etc.

B.

$\frac{2}{3} = 3\overset{.6666\frac{2}{3}}{\overline{)2.0000}}$

$\frac{2}{3} = .6\frac{2}{3}$ or $.66\frac{2}{3}$ etc.

In **A.** the remainder is always **1.**

In **B.** the remainder is always **2.**

Such divisions never terminate. Therefore carry out the division as far as is necessary for the specific purpose at hand.

Change to a decimal. Carry the division to two decimal places and make the remainder a fraction.

1. $\frac{1}{3} \quad \frac{1}{7} \quad \frac{2}{9} \quad \frac{1}{11} \quad \frac{1}{12}$

2. $\frac{1}{6} \quad \frac{5}{6} \quad \frac{5}{18} \quad \frac{11}{18} \quad \frac{5}{12} \quad \frac{7}{12}$

3. $\frac{1}{18} \quad \frac{1}{30} \quad \frac{7}{30} \quad \frac{1}{15} \quad \frac{7}{15} \quad \frac{11}{15}$

4. $\frac{1}{24} \quad \frac{5}{24} \quad \frac{7}{24} \quad \frac{1}{36} \quad \frac{7}{36} \quad \frac{5}{36}$

More Problems

Solve the following:

1. A coffee percolator holds 36.8 cupfuls. How many cups of coffee would 8 of these hold? 294.4 cupfuls

2. Mr. McCollumn works 6.24 hours each day. How many hours does he work in 16 days? 99.84 hr.

3. At $.18 a gallon, how many gallons of gasoline can be bought for $2.16?
12 gal.

4. Robert walked 6.2 miles on Monday, 8.3 on Tuesday, 2.4 miles on Wednesday, and 4.6 miles on Thursday. How many miles did he walk? 21.5 mi.

5. The Senior Boy Scouts are taking a hike of 87.5 miles. If they have traveled 3.5 miles, how much farther must they go?
84 mi.

6. Henry bought two Roy Rogers records at $.75 each, and two Gene Autry records at $.79. How much money had he left from his savings of $10? $6.92

7. What is the product when we multiply 15.2 and 2.9? 44.08

8. Mr. Murray is making a trip of 98.3 miles. If he has already traveled 36.05 miles, how far has he yet to travel?
62.25 mi.

9. How much does one gallon of water weigh if 25 gallons weigh 207.5 lb.?
8.3 lb.

10. In a recent year a National League player had a batting average of .243. Another player's batting average was .221. Find the difference in their batting averages.
.022

11. How much would it cost to paint a floor with an area of 36.4 sq. ft. at $.75 a square foot? $27.30

12. The weights of the boys on St. Francis de Sales baseball team are 125.2 lb., 136.4 lb., 150.6 lb., 160.3 lb., and 122.2 lb. What is their total weight?
694.7 lb.

13. Mrs. Burke bought 15.3 yd. of linoleum for the kitchen floor and 7.8 yd. for the pantry. If it was cut from a 250-yd. roll, how many yards were left on the roll?
226.9 yd.

14. Joseph is making model airplanes. For a certain part of each plane he needs a piece of wire 8.32 inches long. How many pieces of this length can he cut from a strip 49.92 inches long? 6

15. Phyllis paid $15.75 for 3.5 yd. of linen. What was the cost per yard?
$4.50

Measure Your Progress

Part I

Write the answers on your test paper.

1. Take three thousand seventy-three from eighty thousand one hundred twenty.
77,047

2. What number must be added to the sum of 2317 and 4895 to make 8000?
788

3. If $3285 is shared equally by 45 men, how much will each receive? $73

4. From the product of 6.3 and 9.4 take the product of .49 and 57. 31.29

5. When a certain number is multiplied by 7.8, the product is 28.08. Find the number. 3.6

6. Farmer Reed had 834 sheep, and Farmer Daley had 365. If Farmer Reed sold 189 of his to Farmer Daley, how many would each then have? Fr. Reed 645
Fr. Daley 554

7. What is the nearest number to 614, that is exactly divisible by 9?
612

8. What number multiplied by .27 will give the same answer as 7.2 multiplied by 9?
240

9. What number divided by 54 will give the quotient 68 and a remainder of 7?
3679

10. The sum of 78 and another number is 36 less than 260. What is the number?
146

Part II

1. Write the number that is 5 less than 1000.
995

2. Write the number that is 5 more than 10,000.
10,005

3. Write the number that is 9 less than 10 hundreds.

4. Find the sum of nineteen hundred and nineteen thousand.

5. When I drive 27 miles an hour, I can reach my destination in 4.5 hours, but I want to reach it in 3 hours. How fast must I drive?

6. The sum of 8,246.58 and another number is 13,060. What is the other number?

7. If a boy can walk 88.25 yards in 1 minute, how far can he walk in 1 hour?

8. If a clock gains 5.5 seconds every hour, how many minutes will it gain in 3 days?

9. How many times can I fill a 3-pint container from one containing 18 gallons.

10. A 4-gallon pail was half full of water. Tom poured in 5 quarts more. How much water did it then contain?

Part III

Express as decimals. Divide to the second decimal place:

1. $\frac{1}{7}$ $\frac{3}{7}$ $\frac{1}{9}$ $\frac{2}{9}$ $\frac{5}{9}$ $\frac{6}{7}$

2. $\frac{1}{3}$ $\frac{1}{6}$ $\frac{2}{3}$ $\frac{1}{12}$ $\frac{5}{12}$ $\frac{7}{12}$

3. $\frac{2}{15}$ $\frac{4}{15}$ $\frac{7}{15}$ $\frac{1}{18}$ $\frac{5}{18}$ $\frac{1}{30}$

4. $\frac{1}{16}$ $\frac{1}{8}$ $\frac{5}{6}$ $\frac{5}{8}$ $\frac{1}{40}$ $\frac{7}{40}$

Part IV

1. If 2.5 yards of muslin cost 80 cents, what is the cost of 1 yard? 32¢

2. When .75 of a pound of coffee costs 57 cents, what is the price per pound? .76¢

3. Anthony gained 8.75 pounds in 7 months. What was his average monthly gain? $1\frac{1}{4}$ lb.

4. How many pieces of wire 1.5 ft. long can be cut from a coil containing 10 yards? 20

5. Last month Mrs. Landy used 16 packages of tea each containing .875 of a pound. How much tea did she use? 14 lb.

6. John lives 2 miles from school. Harold lives 1.625 miles away. How much farther does John live than Harold? .375

7. How much must be added to $3.50 to make $5.00? $1.50

8. What number is .01 more than 8.09? 8.1

9. Take forty-five hundredths from four hundred five. 404.55.997

10. From three hundred three thousand take three and three thousandths. 302996.997

Part V

1. Add $2\frac{1}{2}$ and $1\frac{2}{3}$. Multiply the sum by $\frac{21}{50}$. $1\frac{3}{4}$

2. From $4\frac{1}{6}$ take $3\frac{5}{8}$. Multiply the remainder by $1\frac{7}{9}$. $\frac{26}{27}$

3. Find the product of $6\frac{1}{4}$ and $3\frac{1}{5}$. From the product take $5\frac{7}{9}$. $14\frac{2}{9}$

4. Find the product of $2\frac{2}{3}$ and $1\frac{1}{12}$. Add $\frac{2}{3}$ to the product. $3\frac{5}{9}$

5. Divide $3\frac{3}{4}$ by $1\frac{1}{9}$. Take $2\frac{3}{4}$ from the quotient. $\frac{5}{8}$

6. Multiply $\frac{15}{16}$ by $\frac{28}{45}$. Divide the product by $\frac{7}{24}$. 2

7. $3\frac{1}{3} \times \frac{9}{25} \times \frac{1}{6}$ ......$\frac{1}{5}$?........

8. $2\frac{1}{4} \times 1\frac{1}{9} \div 1\frac{7}{8}$ $1\frac{1}{3}$?.........

9. Change $7\frac{15}{12}$ to its simplest form. $8\frac{1}{4}$

10. $8\frac{3}{5} = 7\frac{?}{5}$ $\frac{8}{5}$ $\frac{7}{15} = \frac{?}{60}$ $\frac{28}{60}$

Part VI

Write the answers on your test paper:

Match Column B with Column A.

A	B
1. (?) $\frac{3}{8}$ h	(a) $2\frac{2}{3}$
2. (?) "of" g	(b) 9
3. (?) $\frac{9}{7}$ e	(c) $\frac{21}{49}$
4. (?) $4\frac{1}{6}$ j	(d) $3\frac{1}{3}$
5. (?) $\frac{16}{20}$ i	(e) improper
6. (?) $\frac{3}{7}$ c	(f) 1
7. (?) $3 - \frac{1}{3}$ a	(g) times
8. (?) $3 + \frac{1}{3}$ d	(h) proper
9. (?) $3 \div \frac{1}{3}$ b	(i) $\frac{4}{5}$
10. (?) $3 \times \frac{1}{3}$ f	(j) mixed number

UNIT 4 Test

Write the answers on your test paper:

Part I

1. In multiplying decimals, the number of decimal places in the product, must equal (?) the number of decimal places in both the (?) multiplier and the (?) multiplicand.

2. In dividing decimals when the divisor contains decimals, we must first make sure that there are as (?) many decimal places in the dividend as there are in the divisor.

3. There may be (?) more places in the dividend than in the divisor, but there must not (?) be fewer.

4. To change a fraction to a decimal divide the numerator (?) by the denominator (?).

5. Zeros may be added to the right (?) of a decimal without changing its value.

6. To multiply a decimal by 10, move the decimal point (?) one place to the (?) right

7. To multiply a decimal by 1000, move the decimal point (?) 3 places to the (?) right.

8. Moving a decimal point two places to the right in a decimal, multiplies it by (?) 100

9. In the decimal .11, there are 11 (?) hundredths or 1 (?) tenth and 1 (?) hundredths

10. In the number .11 the 1 in the tenths' place is (?) 10 times the 1 in the hundredths place.

Part II

1.	4.06 ×.008 .03248	.007 ×.08 .00056	2.340 ×6.2 14.508
2.	$6.04 ×8 $48.32	$0.15 ×9 $1.35	$8.20 ×10.6 $86.92
3.	2.08 6)12.48	.008 35).28	1.40 $6)$8.40
4.	67 .08)5.36	.02 .007).014	.02 .6).012
5.	40 .3)12	700 .05)35	6000 .006)36
6.	12 .5)6	3.75 .8)3	175 .04)7
7.	7.5 .04).3	18.75 .016).3	1.25 .08).1
8.	300 $.06)$18	$4.05 7)$28.35	20.5 $.08)$1.64

9. The divisor is three tenths, the dividend is 6 hundredths, what is the quotient? .2

10. The quotient is .18, the divisor is .3, what is the dividend? .054

Part III

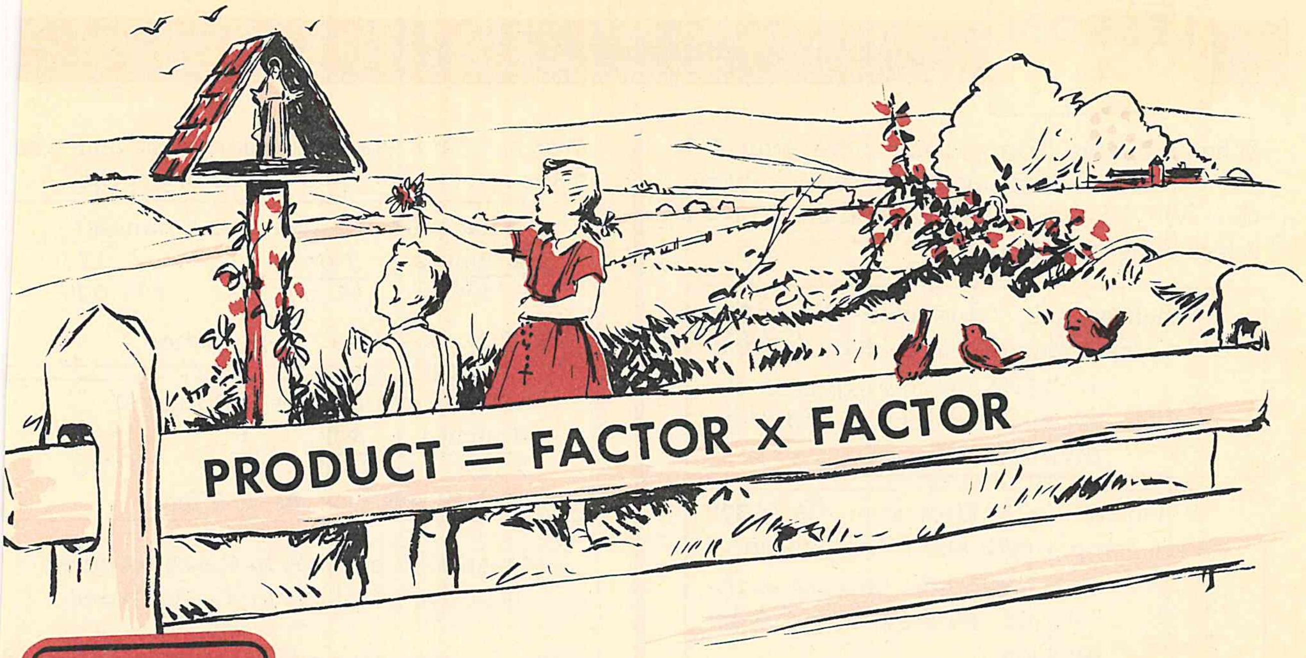
1. Add three successive numbers of which 3.08 is the middle one. 9.24

2. Write in figures the number that represents eighteen dollars and four cents.
$18.04

3. How many quarters can be obtained from $2.05? 8 – 5¢ over

4. What is the number that is .5 the value of 60? 30

5. What number divided by .16 will give .1875 as quotient? .03



UNIT 5 ● WORKING WITH FACTORS AND PRODUCTS

How Well Do You Remember?

Give the answers orally:

1. To find how many times larger one number is than another number ÷ (?) the larger number by the smaller.

2. To find what fractional part one number is of another, divide the larger (?) by the (?) smaller

3. To find what part of a day is an hour, express the day (?) as hours. The answer will be the fraction expressed by dividing (?) 24 by (?) 1.

4. To find what part of 35 is 14, express the comparison by a fraction. The fraction will be (?) 14/35. The answer will be (?) 2/5.

5. In finding what part one number is of another, the number that follows "of" is always the (?) den.

6. When one factor is less than a unit, the product is less (?) than the other factor.

7. When the divisor is less than a unit, the quotient is greater (?) than the dividend.

8. $16 = 8 \times ?$ 2 $\qquad 28 = ?$ 7 $\times 4$
$36 = ?$ 4 $\times 9 \qquad 96 = 12 \times ?$ 8

9. $6 = \frac{3}{7} \times ?$ 14 $\qquad 15 = \frac{5}{6} \times ?$ 18
$18 = ?$ 2/3 $\times 27 \qquad 24 = ?$ 3/4 $\times 32$

10. $28 = ?$ 1 1/3 $\times 21 \qquad 90 = 3\frac{1}{3} \times ?$ 27
$30 = 1\frac{1}{5} \times ?$ 25 $\qquad ? = 1\frac{3}{5} \times 60$ 96

11. $25 = .5 \times ?$ 50 $\qquad 18 = .9 \times ?$ 20
$32 = ? \times 64$ 1/2 $\qquad ? = .25 \times 64$ 16

12. $20 = .4 \times ?$ 50 $\qquad 50 = .5 \times ?$ 100
$38 = ? \times 76$ 1/2 $\qquad ? = .75 \times 60$ 45

LESSON 1.

Comparing Numbers

When we ask, "How much more than **8** is **10?**" we are comparing **8** and **10** by subtraction. We see that **10** is **2** more than **8**, or **8** is **2** less than **10**.

When we ask, "How many times **3** is **6?**" we are comparing **6** and **3** by division.

$\frac{6}{3} = 2$ In this example **2** expresses the relation between **6** and **3** by division.

When we ask, "What part of **6** is **3?**" we are comparing **3** and **6** by division.

$\frac{3}{6} = \frac{1}{2}$ In this example $\frac{1}{2}$ expresses the relation between **3** and **6** by division.

Be sure to place the number or quantity that follows "of" in the denominator.

Solve. Express your answer as a fraction and as a decimal.

1. If Anthony attended school 35 days out of 40, what part of the total number of days did Anthony attend school? 7/8 — .875
2. In a basket containing 48 oranges, 6 of them were decayed. What part of the total number was decayed? $\frac{1}{8}$ .125
3. Out of 20 examples, Joseph had 16 correct. What part of the number worked did Joseph have right? 4/5 or ~~.76 2/3~~ .8
4. During the holidays David earned $75. He spent $15 on presents for the family and saved the rest. What part of the money earned did David spend? 1/5 or .2
5. During the month of November we had fair weather every day except 3. What part of the total number of days was unpleasant? 1/10 or .1
6. Larry tries to say the rosary every day. During the past 25 days, he has missed only 1 day. What part of the given number of days did he miss saying the rosary? 1/25 or .04

We may find what fractional part and wha decimal part one quantity is of another.

What part of a pound is 2 ounces?

$$\frac{2 \text{ ounces}}{1 \text{ pound}} = \frac{2 \text{ oz.}}{16 \text{ oz.}} = \frac{1}{8} \qquad 8\overline{)1.000}^{\;.125}$$

So **2** oz. is $\frac{1}{8}$ or **.125** of a pound.

What part of **2** feet is **8** inches?

$$\frac{8 \text{ inches}}{2 \text{ feet}} = \frac{8 \text{ in.}}{24 \text{ in.}} = \frac{1}{3} \qquad 3\overline{)1.0}^{\;.3\frac{1}{3}}$$

So **8** inches is $\frac{1}{3}$ or $.3\frac{1}{3}$ of **2** feet.

Quantities must be in the same unit of measure before they can be compared.

Solve. Express your answer as a fraction and as a decimal.

What part:

1.	of 1 hour is 12 min.? 1/5 or .2	of 1 week is 1 day? 1/7 or .14 2/7
2.	of 1 min. is 10 sec.? 1/6 or .16 2/3	of 1 yd. is 1 ft.? 1/3 or .33 1/3
3.	of 1 day is 6 hr.? 1/4 or .25	of 1 year is 1 mo.? 1/12 or .08 1/3
4.	of 1 qt. is 1 pt.? 1/2 or .5	of 1 gal. is 1 qt.? 1/4 or .25
5.	of 2 yd. is 4 ft.? 2/3 or .66 2/3	of 1 yd. is 6 in.? 1/6 or .16 2/3
6.	of 1 dollar is 10¢? 1/10 or .1	of 1 dollar is 5¢? 1/20 or .05
7.	of 1 dollar is 4¢? 1/25 or .04	of 1 dollar is 2¢? 1/50 or .02
8.	of 1 dollar is 1¢ 1/100 or .01	of 1 dollar is 8¢? 2/25 or .08
9.	of 1 mile is 80 rd.? 1/4 or .25	of 1 mile is 440 yd.? 1/4 or .25
10.	of 1 cwt. is 20 lb.? 1/5 or .2	of 1 cwt. is 1 lb.? 1/100 or .01
11.	of 2 ft. is 6 in.? 1/4 or .25	of 1 min. is 12 sec.? 1/5 or .2
12.	of 2 min. is 30 sec.?	of 1 yr. is 3 mo.?
13.	of 3 lb. is 6 oz.? 1/8 or .125	of 2 doz. is 6? 1/4 or .25

LESSON 2.

Product and Factors

What is the product of **5** and **2**? **10 = 5 × 2**
When two numbers are multiplied together the result is called the *Product* and the numbers multiplied are called the *factors* of that product.
5 and **2** are factors of the product **10,** so both are contained in **10.**

A product contains both of its factors.

Therefore we have the following Basic Principles:

Product = factor × factor

$$\text{factor} = \frac{\text{Product}}{\text{factor}}$$

?	=	**2**	×	**5**
10	=	?	×	**5**
10	=	**2**	×	?

When we are finding a Product, the process is always Multiplication. P = f × f

When we are finding a Factor, the process is always Division. $f = \frac{P}{f}$

In the following tell whether you are finding a product or a factor, and what process should be used. Find the answers:

	Group 1	Group 2
	P = f × f	P = f × f
1.	? 18 = 6 × 3	39 = 3 × 13?
2.	45 = 5 ? × 9	72 = 9 × 8 ?
3.	? 56 = 8 × 7	60 = 10? × 6
4.	? 50 = 5 × 10	? 90 = 10 × 9
5.	32 = 2 × 16 ?	80 = 5? × 16
6.	90 = 45? × 2	96 = 12 × 8 ?
7.	3 = $1\frac{1}{5}$ × 2 ? 1/2	9 = ? 6 × $1\frac{1}{2}$
8.	50 = ? 5 × 10	? = $1\frac{4}{5}$ × $2\frac{1}{3}$ 4 1/5

The following problems fit some of the types given in Column **1.** Can you recognize them?

Do your work as shown below:

(a) Don bought **10** pencils at **5**¢ each. What did he pay for them?

This fits **4** in Group One
C. of all = C. of **1** × no. bought
? = **5¢** × **10** P ×

(b) Jack paid **60¢** for **6** giant taffies. What did he pay for **1**?
This fits **3** in Group Two.
C. of all = C. of **1** × no. bought
60¢ = ? × **6** f ÷

Solve:

1. Ann paid 80¢ for 16 small cakes. What did she pay for each? 5¢

2. Nora paid 72¢ for grapefruit at 9¢ each. How many did she buy? 8

3. George paid 45¢ for 9 balloons. What did each cost? 5¢

4. What must Marie pay for 9 copybooks at 10¢ each? 90

5. Anthony paid 90¢ for 2 ties. What did each cost? 45

6. Michael paid 32¢ for marbles at 2¢ each. How many did he buy? 16

7. What must Helen pay for 7 yards of ribbon at 8¢ per yard? 56¢

8. How much apiece are ice cream cones if 10 cost 50¢? 5¢

9. Paul paid $3 for window screening at $\$1\frac{1}{5}$ per yard. How many yards did he buy? 2 1/2

10. What will $2\frac{1}{3}$ yds. of muslin cost at $\$1\frac{4}{5}$ per yard? $4.20

More Products and Factors

When one factor is less than a unit, the product is less than the other factor.

Product = factor × factor

$$\$3 = \$12 \times \tfrac{1}{4}$$

$$\$3 = \$12 \times .25$$

In the following examples find the missing product or factor.

Product = factor × factor

1. $3.00 $? = \$15 \times .2$

2. $9. $? = \$24 \times \frac{3}{8}$

3. $7 $? = \$42 \times \frac{1}{6}$

4. $24 $? = \$60 \times .4$

5. $60. $? = \$90 \times \frac{2}{3}$

6. $120 $\$90 = ? \times .75$

7. $\$100 = ?$ $160. $\times \frac{5}{8}$

8. $\$150 = ?$ $180. $\times \frac{5}{6}$

9. $\$140 = ?$ ~~$184~~ $\times .875$ → ans. $160

10. $\$300 = ?$ $450 $\times \frac{2}{3}$

11. $?$ $150. $= \$240 \times .625$

12. $\$39$ $260. $= ? \times \frac{3}{20}$

13. $?$ $10 $= \$200 \times .05$

14. $\$12$ $.04 $= \$300 \times ?$

15. $?$ ¢28. $= \$350 \times .08$

$$P = f \times f$$

Cost of all = Cost of 1 × fractional part bought

$$\text{Cost of } \mathbf{1} = \frac{\text{Cost of all}}{\text{fr. pt. bt.}} \qquad f = \frac{P}{f}$$

$$\text{fr. pt. bt.} = \frac{\text{Cost of all}}{\text{Cost of } \mathbf{1}} \qquad f = \frac{P}{f}$$

Remember that the cost of 1 and the number or fractional part bought are always factors, and to find either of them, the process is division.

In the following problems there will be two factors given to find a product, or there will be a product and a factor given to find the other factor. Tell what each is, and what process you will use to find the answer.

Then solve the problem.

1. Jane bought $\frac{7}{8}$ of a yard of silk at 96¢ a yard. What did she pay for it?

2. Lucy paid 60¢ for $\frac{3}{4}$ of a yard of lace. What was the price per yard?

3. At 96 cents a yard, what part of a yard of material can Eleanor buy for 60¢?

4. Paul bought $\frac{5}{6}$ of a yard of canvas to mend his tent. If the canvas cost 60¢ a yard, how much did Paul pay?

5. At 60 cents a dozen, what part of a dozen of eggs can be bought for 40¢?

6. Charles paid 20 cents for $\frac{5}{8}$ of a dozen cookies. How much would he pay for 1 dozen?

7. At 75 cents a yard, what will $\frac{4}{5}$ of a yard of netting cost?

8. Mrs. Lee paid 72 cents for $\frac{8}{9}$ of a pound of coffee. How much a pound was this?

More Factors and Products

Product = factor × factor
3 = **24** × ?

To find the missing factor, divide the product **3** by the factor **24.** The missing factor must be less than a unit, because the product **3** is less than the factor **24.**

So we find what part *of* **24** is **3.**
The number following "of" is a factor.
$\frac{3}{24} = \frac{1}{8}$. $\frac{1}{8}$ is the fractional part.

$\frac{1}{8} = 8\overline{)1.000}$ with quotient **.125**   **.125** is the decimal part

Find the missing factor. Give the answer as a fraction and as a decimal:

Product = factor × factor

1. 30 = 40 × 3/4 ? .75

2. 8 = 32 × 1/4 ? .25

3. 24 = 64 × 3/8 ? 3.75

4. 40 = 50 × 4/5 ? .8

5. 8 = 160 × 1/20 ? .05

6. 10 = 250 × 1/25 ? .04

7. 14 = 175 × ~~2~~ 2/25 .08

8. 75 = 300 × ~~4/25~~ ? ~~2~~ 1/4 .25

9. 160 = 200 × 4/5 ? .8 - .75

10. 150 = 200 × 3/4 ? .75

11. What part of 250 is 200? 4/5 .8

12. What part of 280 is 140? 1/2 .5

13. What part of 200 is 180? 9/10 .9

14. What part of 125 is 100? 4/5 .8

Study the following example:

Michael earned **$200.** He spent **$16.** What part *of the money earned* did he spend?

(To find what part one number is of another is to find a factor.)

Product = factor × factor
$16 = **$200** × ?
= $\frac{16}{200}$ = $\frac{2}{25}$ fractional part

= $\frac{2}{25}$ = $25\overline{)2.00}$ with quotient **.08** decimal part

Check: Product = factor × factor
$16 = **$200** × **.08**

Solve. Give the answer as a fraction and as a decimal.

1. Teresa earned $15 and spent $3. What part of the money earned did she spend? 1/5 - .2

2. Carol saved $24 and spent $6 for her mother's birthday present. What part of her savings did she spend? 1/4 .25

3. Henry answered 20 questions in geography. If 3 answers were incorrect, what part of the questions answered was incorrect? 3/20 .15

4. During a certain month of 30 days, 6 were rainy and the rest fair. What part of the total number of days was rainy? 1/5 .2

5. One chair cost $20. Another cost $15. What part of the cost of the first chair was the cost of the second? 3/4 .75

6. The height of a pole is 18 feet and the height of the tree is 24 ft. What part of the tree's height is the pole's? ~~18/24~~ 3/4 .75

7. Dick had 40 marbles. Robert had 15. Robert's number equaled what part of Dick's? 3/8 .375

LESSON

Speed Problems

Product = factor × factor
Distance = m.p.h. × time

A. If a plane is going **250** m.p.h., how far will it go in **5** hours?
Product = factor × factor
Total Distance = m.p.h. × time
? = **250** × **5** P ×
In this example we must find the distance covered, therefore we are looking for a *product* and must *multiply* factor × factor.

B. If a plane is going **250** m.p.h., how long will it take it to go **1250** mi.?
Product = factor × factor
Total Distance = m.p.h. × time
1250 = **250** × ? f ÷
In this example, we must find the time. We are looking for a *factor,* therefore we must *divide* the product by the given factor.

C. What speed per hour must a plane go in order to cover **1250** mi. in **5** hours?
Product = factor × factor
Total Distance = m.p.h. × time
1250 = ? × **5** f ÷
In this example, we must find the number of miles per hour. We are looking for a *factor,* therefore we must *divide* the product by the given factor.

Solve the following, using the method given above:

1. If a train averages 50 m.p.h., how far will it go in 6 hours?

2. When an automobile is going at a speed of 45 m.p.h., how long will it take to go 270 miles?

3. How many miles per hour must a plane go in order to cover 840 miles in 4 hours?

4. A fast train can travel 90 miles an hour. How long will it take to cover 810 miles?

Solve the following. Follow the method given in Column 1.

1. A certain plane can go 250 m.p.h. At this speed how far will it go in 6 hr.?

2. If a plane is going 260 m.p.h., how long will it take it to go 1040 miles?

3. What speed per hour must a plane average in order to cover 1260 miles in 7 hours?

4. If Mr. Bonner keeps a speed of 45 m.p.h., how far will he go by auto in 6.4 hours?

5. At an average speed of 48 m.p.h., how long will it take a man to drive 163.2 miles?

6. What speed per hour must a driver average if he wants to drive 283.5 miles in 4.5 hours?

7. At a speed of 50 m.p.h., how far will a train go in $2\frac{1}{2}$ hours?

8. When a train is speeding 60 m.p.h., how long will it take it to go 270 miles?

9. When he is being hunted a red fox can average 26 m.p.h. How long will it take him to run 39 miles?

10. A motorcycle averaging 75 miles per hour will travel how far in 4.5 hours?

11. On a vacation trip to Glacier National Park, a distance of 383.4 miles, the Cashin family drove at the rate of 42.6 miles per hour. How many hours did it take them to reach their destination?

The Missing Factor

Remember:

The Product of any two numbers contains both of its factors.
When looking for a factor, the Product is the number into which we divide.
The factors are contained in the Product, therefore they are the divisors.
When the Product is divided by one factor, the other factor is the quotient.

$$\begin{array}{lrcl} & P & = & f \times f \\ \textbf{A.} & ? & = & \mathbf{5} \times \mathbf{2} \\ \textbf{B.} & \mathbf{10} & = & \mathbf{5} \times ? \\ \textbf{C.} & \mathbf{10} & = & ? \times \mathbf{2} \end{array} \left.\vphantom{\begin{array}{l}a\\a\\a\end{array}}\right\} f = \frac{P}{f}$$

In **A**, the product is **5 × 2** which equals **10**

In **B**, the missing factor is $\frac{10}{5}$ which equals **2**

In **C**, the missing factor is $\frac{10}{2}$ which equals **5**

$$\begin{array}{lrcl} & P & = & f \times f \\ \textbf{A.} & ? & = & \mathbf{20} \times \frac{4}{5} \\ \textbf{B.} & \mathbf{16} & = & ? \times \frac{4}{5} \\ \textbf{C.} & \mathbf{16} & = & \mathbf{20} \times ? \end{array} \left.\vphantom{\begin{array}{l}a\\a\\a\end{array}}\right\} f = \frac{P}{f}$$

In **A**, the product is $\mathbf{20} \times \frac{4}{5}$ which equals **16**

In **B**, the missing factor is $\frac{16}{\frac{4}{5}}$ which equals **20**

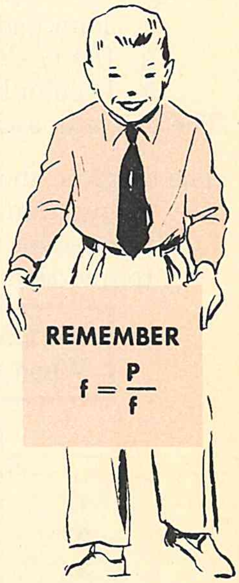
In **C**, the missing factor is $\frac{16}{20}$ which equals $\frac{4}{5}$

$$\begin{array}{lrcl} & P & = & f \times f \\ \textbf{A.} & ? & = & \mathbf{20} \times \mathbf{.8} \\ \textbf{B.} & \mathbf{16} & = & ? \times \mathbf{.8} \\ \textbf{C.} & \mathbf{16} & = & \mathbf{20} \times ? \end{array} \left.\vphantom{\begin{array}{l}a\\a\\a\end{array}}\right\} f = \frac{P}{f}$$

In **A**, the product is **20 × .8** which equals **16**

In **B**, the missing factor is $\frac{16}{.8}$ which equals **20**

In **C**, the missing factor is $\frac{16}{20}$ which equals **.8**



Fit these problems into the types given above and solve:

1. (a) Find $\frac{4}{5}$ of 20
(b) $16 = \frac{4}{5}$ of what number?
(c) $16 =$ what fractional part of 20?

2. (a) Find .25 of 40
(b) $10 = \frac{1}{4}$ of what number?
(c) $10 =$ what decimal part of 40?

3. (a) What is $\frac{3}{4}$ of 24?
(b) $18 = \frac{3}{4}$ of what number?
(c) $18 =$ what fractional part of 24?

4. (a) What is .4 of 25?
(b) $10 = \frac{2}{5}$ of what number?
(c) $10 =$ what decimal part of 25?

5. (a) What is .6 of 60?
(b) $36 = \frac{3}{5}$ of what number?
(c) $36 =$ what decimal part of 60?

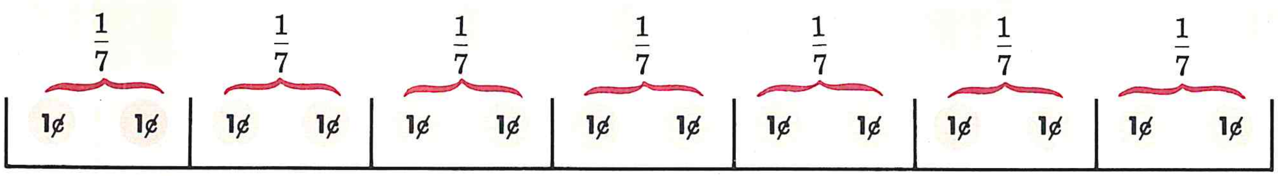
1. (a) Find $\frac{5}{6}$ of 18.
(b) $15 = \frac{5}{6}$ of what number?
(c) $15 =$ what fractional part of 18?

2. (a) Find $\frac{4}{9}$ of 45.
(b) $20 = \frac{4}{9}$ of what number?
(c) $20 =$ what fractional part of 45?

3. (a) Find .125 of 24.
(b) $3 = .125$ of what number?
(c) $3 =$ what decimal part of 24?

4. (a) Find .75 of 32.
(b) $24 = .75$ of what number?
(c) $24 =$ what decimal part of 32?

5. (a) What is $\frac{2}{7}$ of 28?
(b) $8 = \frac{2}{7}$ of what number?
(c) $8 =$ what fractional part of 28?



LESSON 5.

More Factors and Products

Study the following:

1. John had **14¢**. He spent $\frac{4}{7}$ *of it*. How much did he spend?
2. If $\frac{4}{7}$ *of John's money* equalled **8¢**, how much money had he?
3. If John had **14¢** and he spent **8¢**, what part *of his money* did he spend?

The above questions can be answered by examining the diagram above:

The diagram shows that the answer
to question **1** is **8¢**. It can be obtained by multiplying $\frac{4}{7} \times 14$
to question **2** is **14¢**. It can be obtained by dividing **8** by $\frac{4}{7}$
to question **3** is $\frac{4}{7}$. It can be obtained by dividing **8** by **14**

> NOTE. When "of" follows a fraction, that which follows "of" is a factor. When the factor is less than **1**, the product is less than the other factor.

	Product	=	factor	×	factor
	money spent	=	frac. part spent	×	money had
1.	?	=	$\frac{4}{7}$		*of it* (meaning of **14¢**) *multiply*
2.	**8**	=	$\frac{4}{7}$		*of John's money* (this is to be found) *divide*
3.	**8**	=	?		*of his money* (meaning of **14¢**) *divide*

The word "of" following a fraction means ×, so change "of" to × in the above.

In some of the following problems two factors are given and a product is to be found. In others, a product and one factor are given, and the other factor is to be found. Tell which are products and which are factors:

1. Mary saved \$60, and spent \$10. What part of her money did she spend?

2. In our class there are 40 pupils. $\frac{5}{8}$ of them are boys. How many are boys?

3. If 18¢ equals $\frac{2}{3}$ of Patricia's money, how much money has Patricia?

4. Helen made 24 cup cakes. The children ate 20. What part of the cup cakes were eaten?

5. Margaret is 12 years old. Rose Marie's age is $\frac{7}{8}$ of Margaret's. How old is Rose Marie?

6. \$21 is $\frac{7}{8}$ of the price of Loretta's coat. What did the coat cost?

7. If $\frac{2}{5}$ of Mr. Baraldi's age is 14 years, how old is he?

8. Henry had 32 marbles. He gave $\frac{1}{8}$ of them to Charles. How many did he give to Charles?

9. If 30¢ was the price Helen paid for $\frac{3}{4}$ of a yard of lace, how much would a yard cost?

10. Mary Ellen had 25¢. She spent 10¢. What part of her money did she spend?

LESSON 6.

Review of the Three Kinds of Problems

1. Two factors are given; find the product.

What is $\frac{3}{8}$ *of* **56**?

$P = f \times f$

$? = \frac{3}{8} \times \mathbf{56}$ (mul. $\frac{3}{8} \times \mathbf{56}$)

$\mathbf{21} = \frac{3}{8} \times \mathbf{56}$

2. A product and a factor are given; find the other factor.

What part *of* **56** is **21**?

$f = \dfrac{P}{f}$

$P = f \times f$

$\mathbf{21} = ? \times \mathbf{56}$ (div. **21** by **56**)

$\mathbf{21} = \frac{3}{8} \times \mathbf{56}$

3. A product and a factor are given; find the other factor.

If $\frac{3}{8}$ *of a number* is **21**, what is the number?

$f = \dfrac{P}{f}$

$P = f \times f$

$\mathbf{21} = \frac{3}{8} \times\ ?$ (div. **21** by $\frac{3}{8}$)

$\mathbf{21} = \frac{3}{8} \times \mathbf{56}$

In the following, tell which are factors and which are products; then solve as shown above:

1. What is $\frac{9}{10}$ of 50?

2. What part of 50 is 45?

3. If $\frac{9}{10}$ of a number is 45, find the number.

4. What is $\frac{7}{8}$ of 96?

5. What part of 36 is 24?

6. If $\frac{5}{6}$ of a number is 30, find the number.

7. Find $\frac{7}{12}$ of 120.

8. What part of 108 is 60?

9. 48 is $\frac{3}{8}$ of what number?

10. What is $\frac{8}{9}$ of 63?

11. What part of 96 is 72?

12. 56 is $\frac{2}{3}$ of what number?

13. What is .375 of 32?

14. What decimal part of 50 is 40?

15. 32 is .8 of what number?

16. What is .75 of 84?

17. What decimal part of 64 is 24?

18. 60 is $\frac{3}{4}$ of what number?

19. 90 is .6 of what number?

20. What decimal part of 50 is 20?

Remember: If you are looking for the factor which follows the word *of,* you must divide.

Solve the following:

1. 60 is $\frac{3}{5}$ of what number?

2. If $\frac{4}{7}$ of a number is 32, what is the number?

3. If $\frac{7}{8}$ of a number is 56, what is the number?

4. 75 is .6 of what number?

5. 120 is .375 of what number?

6. 126 is .3 of what number?

7. If $\frac{5}{8}$ of a number is 35, what is the number?

8. 90 is .9 of a certain number. What is the number?

9. 72 is .75 of a certain number. What is the number?

10. 63 is .875 of a certain number. What is the number?

11. 15 is $\frac{3}{4}$ of Mary's age. Find Mary's age.

12. 65 is $\frac{5}{6}$ of Dick's weight. Find his weight.

13. 72 is $\frac{9}{10}$ of Bob's money. What is Bob's money?

14. \$36 is $\frac{4}{9}$ of Jack's savings. Find Jack's savings.

15. If $\frac{3}{4}$ of the length of a room is 18 ft., what is the length of the room?

16. If $\frac{3}{4}$ of the cost of a house is \$6300, what is the cost of the house?

LESSON 7.

Cancellation

Find the value of $28 \times 18 \div 12$

This example contains both multiplication and division. It can be done in two ways.

(a) $28 \times 18 = 504 \qquad 504 \div 12 = 42$

(b) By cancellation: $\dfrac{28 \times 18}{12}$

$\dfrac{28 \times \overset{3}{\cancel{18}}}{\underset{2}{\cancel{12}}}$ Divide the numerator **18** and the denominator **12** by **6**.

$\dfrac{\overset{14}{\cancel{28}} \times \overset{3}{\cancel{18}}}{\underset{\underset{1}{\cancel{2}}}{\cancel{12}}}$ Divide the numerator **28** and the denominator **2** by **2**.

The numerator now is **14×3**

The denominator now is **1**.

$\dfrac{42}{1} = 42$ The result is **42**.

Study this explanation:

If **8** articles cost **24¢**, find the cost of **1**.

To find the cost of **1**, divide $\dfrac{24¢}{8}$

The answer is **3¢**.

If **1** article cost **3¢**, what will **9** cost?

To find the cost of **9**, multiply **9×3¢**

The answer is **27¢**.

Combining the above into one problem, it will read:

If **8** articles cost **24¢**, what will **9** cost?

Step **1**. Divide to find the cost of **1**.

$$\frac{24¢}{8} = 3¢$$

Step **2**. Multiply to find the cost of **9**.

$$9 \times 3¢ = 27¢$$

Putting both steps together, we have

$$\frac{24¢}{8} \times \frac{9}{1} \text{ or } \frac{\overset{3}{\cancel{24¢}} \times 9}{\underset{1}{\cancel{8}}} = \frac{27¢}{1} = 27¢$$

The answer is **27¢**.

Use cancellation to find the value of the following:

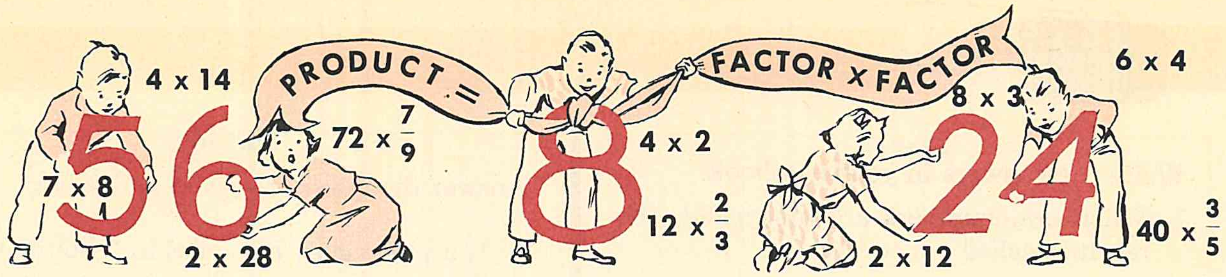
1. 8×9÷12	50×48÷15
2. 16×21÷12	16×21÷56
3. 25×18÷15	75×24÷40
4. 12×25÷20	18×36÷108
5. 32×15÷40	32×49÷56
6. 22×18÷33	63×80÷120
7. 56×24÷28	35×24÷30
8. 36×21÷27	48×45÷72
9. 15×45÷25	54×36÷81
10. 42×35÷30	56×30÷48

In the following examples, the answers are mixed numbers:

11. 36×26÷16	64×21÷96
12. 27×18÷36	81×15÷108
13. 28×14÷21	72×24÷84
14. 64×48÷96	25×15÷45
15. 24×18÷56	27×36÷54

Solve by cancellation:

1. If 6 articles cost \$33, what will 14 cost?
2. If 8 articles cost \$20, what will 6 cost?
3. If 12 articles cost \$20, what will 9 cost?
4. If 6 articles cost \$14, what will 9 cost?
5. If 18 articles cost \$42, what will 15 cost?
6. If 16 articles cost \$30, what will 24 cost?
7. If 20 articles cost \$35, what will 8 cost?
8. If 15 articles cost \$25, what will 9 cost?
9. If 21 articles cost \$35, what will 18 cost?
10. If 27 articles cost \$33, what will 18 cost?
11. If 26 articles cost \$32, what will 39 cost?
12. If 18 articles cost \$22, what will 27 cost?
13. If 14 articles cost \$42, what will 8 cost?
14. If 15 articles cost \$20, what will 9 cost?
15. If 15 articles cost \$27, what will 10 cost?
16. If 18 articles cost \$21, what will 4 cost?
17. If 20 articles cost \$34, what will 15 cost?
18. If 15 articles cost \$65, what will 4 cost?



LESSON 8.

Factors

You will find the problems 1 to 5 in Column 1 arranged for you below. Account for the placing of each product and factor.

Find the answers:

	Product	=	factor	×	factor
1.	?	=	$\frac{1}{5}$	×	$280
2.	$9	=	$\frac{3}{8}$	×	?
3.	$10	=	$\frac{5}{8}$	×	?
4.	$12	=	?	×	$15
5.	2	=	?	×	16

1. Tom's father earns $280 a month. If he spends $\frac{1}{5}$ of it for rent, how much rent does he pay?

2. If $9 equals $\frac{3}{8}$ of Ray's money, how much money has Ray?

3. If $10 is $\frac{5}{8}$ of the cost of Peg's coat, how much will the coat cost?

4. Edward wants to buy a camera worth $15. He has only $12. What part of the price of the camera has Edward?

5. Bob had $16. He spent $2. What part of his money did he spend?

6. James has read 36 books this year. If this is $\frac{2}{5}$ of the number of books in our class library, how many books are in our library?

7. In a recent test, Frances answered 21 questions correctly. If this was $\frac{7}{8}$ of the questions given, how many were given?

8. If 120 lb. equals $\frac{3}{4}$ of Pvt. Hamilton's weight, what is his weight?

Measure Your Progress

Solve:

1. Philip can earn 60¢ in $\frac{3}{4}$ of an hour, what can he earn in an hour?

2. If Bob earns 90¢ in $1\frac{1}{5}$ hours, what can he earn in an hour?

3. Anita earned 80¢ in 50 minutes. What did she average an hour?

4. How much should Catherine earn if she works 1 hour and 30 minutes at 60¢ an hour?

5. Jane earned 90¢ and bought a book for 60¢. What part of her earnings did Jane spend?

6. If $1.50 is .375 of Edward's money, how much money has he?

7. Carl saved $3.60. He spent .25 of it. How much did he spend?

8. If 30 lb. of coffee cost $24, what will 50 lb. cost?

UNIT 5 TEST

Part I

Write the answers in your notebook:

1. When two numbers are multiplied, the result is called a ....(?).....

2. A product equals a .(?). times a .(?)..

3. To find one factor, ...(?).... the product by the other ....(?).....

4. If $392 was .875 of the cost of Mrs. Mullen's fur coat, how much did the coat cost?
In the above problem, $392 is a ...(?)... (product or factor); .875 is a ....(?)... (product or factor). To find the answer we ....(?).... (multiply or divide) $392 by .875.

5. John earned $16, and spent $2. What decimal part of his earnings did John spend?
In the above problem, $16 is a ....(?).... (product or factor); $2 is a ......(?).... (product or factor). In order to solve this problem, we must find what part of ....(?)... is ....(?).... The number that follows "of" is a ....(?).....

Part II

Match Column 2 with Column 1.

Column 1	Column 2
c **1.** (?) .125	(a) $\frac{3}{5}$ 1-
a **2.** (?) .6	(b) $\frac{3}{100}$ 2-
e **3.** (?) .875	(c) $\frac{1}{8}$ 3-
h **4.** (?) .05	(d) $\frac{1}{25}$ 4-
b **5.** (?) .03	(e) $\frac{7}{8}$ 5-
j **6.** (?) .8	(f) $\frac{3}{8}$ 6-
i **7.** (?) .625	(g) $\frac{1}{100}$ 7-
d **8.** (?) .04	(h) $\frac{1}{20}$ 8
f **9.** (?) .375	(i) $\frac{5}{8}$ 9.
g **10.** (?) .01	(j) $\frac{4}{5}$ 10

Part III

Answer the questions given and solve:

1. If a plane goes 750 miles in 3 hours, what is its speed per hour?
To find m.p.h. is to find a ....(?)....... (product or factor).

2. When a man is driving 45 miles an hour, how far can he go in 2.4 hours?
To find total distance is to find a ....(?).....

3. If a bus averages 30 m.p.h., how long will it take it to go 75 miles?
To find the time is to find a ......(?).......

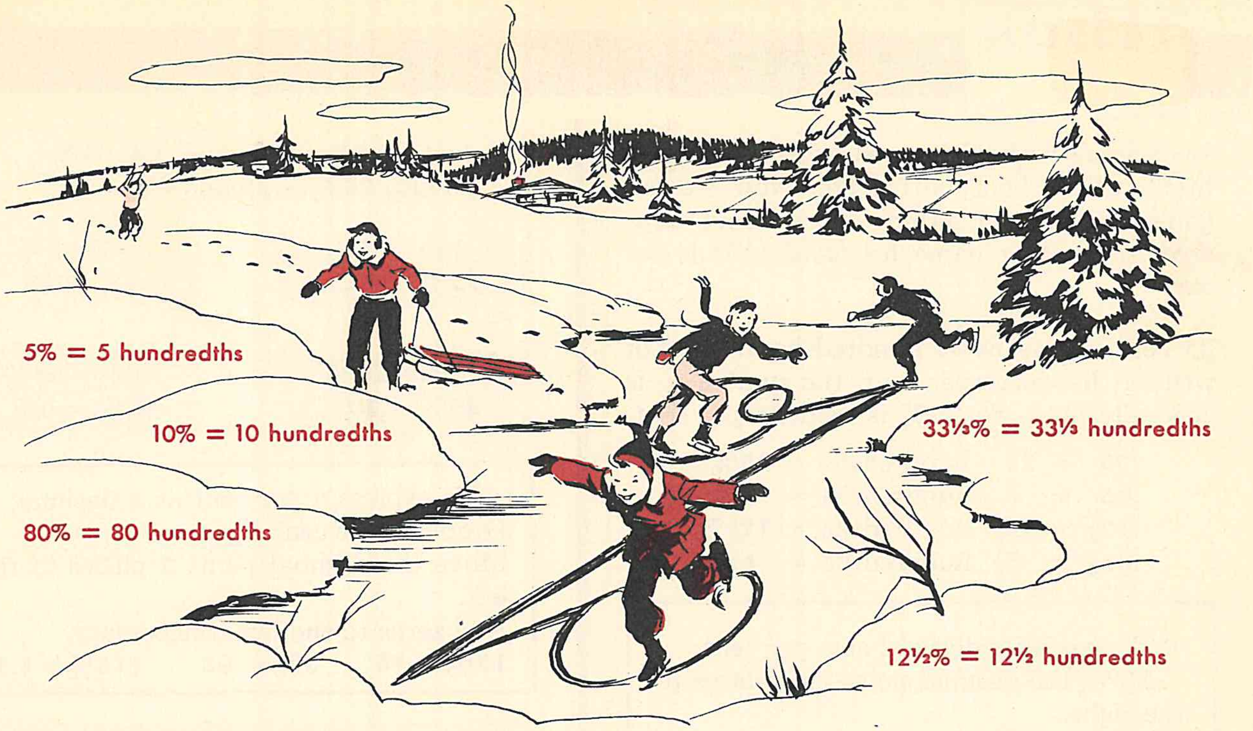
4. If $\frac{3}{4}$ of the height of one of the famous California Redwood trees is 273 feet, how high is this particular tree?

5. The Hoover Dam in the Colorado River is 727 feet high. The Aswan Dam on the Nile River is 174 feet high. What part of the height of the Hoover Dam is the height of the Aswan?

6. The famous Statue of Liberty is on Bedloe Island in New York Harbor. If $\frac{1}{3}$ of the height of this statue is about 30 feet, how high is it?

7. The longest river in the world is the Nile River which is 4,000 miles long. The Missouri-Mississippi River is 3188 miles long. What decimal part of the length of the Nile is the length of the Missouri-Mississippi? (Answer to three decimal places)

8. Death Valley in eastern California is a vast desert. It contains the lowest spot in the United States which is about 300 feet below sea level. Not far from this is Mt. Whitney, the highest point in the United States. If Mt. Whitney is a little less than 50 times as high as Death Valley is low, about how high is Mt. Whitney?



UNIT 6 • WORKING WITH PERCENTAGE

All around us we hear and see the term per cent—a profit of **20%**, a **15%** increase, interest at **4%**, a **15%** decrease. The word per cent is taken from the Latin words *per centum* which mean "on the hundred." According to present day usage the term per cent means hundredths. The symbol (%) means per cent.

Thus **15%** increase means an increase fractionally of $\frac{15}{100}$ or decimally of **.15**. Therefore **15** per cent is a fraction whose numerator is **15** and whose denominator is **100**, or **15** per cent may be expressed as a decimal ending in the second place. "Per cent" always means hundredths. So **20%** equals **.20** or $\frac{20}{100}$.

How Well Do You Remember?

Give the answers orally:

1. A profit of 20 per cent may be written as 20%. The symbol % means ……(?)…….
2. The word per cent is derived from the Latin words ……(?)…… which mean ……(?)…… …….
3. An increase in salary of 18% means an increase of ……(?)…… fractionally or ……(?)…… decimally.
4. A reduction of 25% means a reduction fractionally of ……(?)…… or decimally of ……(?)…….
5. The meaning of the word per cent is always ……(?)…….
6. The symbol for per cent is ……(?)…….
7. Express as fractions with a denominator of 100: 75%, 36%, 24%, 18%, 45%.
8. Express as decimals: 35%, 28%, 72%, 98%, 25%.

LESSON
1.

Percentage

In decimals we have learned to express tenths, hundredths, thousandths, etc. Now we are going to learn something more about *hundredths*. Another name for *hundredths* is *per cent.*

35 per cent means **35** hundredths. Instead of writing the words per cent, the symbol % is generally used. So **25%** is read **25** per cent.

$.25 = 25$ hundredths $= 25\%$
$.05 = 5$ hundredths $= 5\%$
$.12\frac{1}{2} = 12\frac{1}{2}$ hundredths $= 12\frac{1}{2}\%$
$.06\frac{1}{4} = 6\frac{1}{4}$ hundredths $= 6\frac{1}{4}\%$

To express a decimal as a per cent:
Move the decimal point two places to the right.
Write the per cent sign (%)
$.02 = 2\%$ $.08\frac{1}{3} = 8\frac{1}{3}\%$

Add zeros to the right if necessary.
$.2 = .20 = 20\%$

Read the following as per cents:

1. $.62$, $.54$, $.15$, $.18$, $.75$, $.82$
2. $.02$, $.04$, $.01$, $.03$, $.07$, $.08$
3. $.12\frac{1}{2}$, $.33\frac{1}{3}$, $.66\frac{2}{3}$, $.37\frac{1}{2}$, $.87\frac{1}{2}$, $.16\frac{2}{3}$
4. $.14\frac{2}{7}$, $.11\frac{1}{9}$, $.83\frac{1}{3}$, $.28\frac{4}{7}$, $.22\frac{2}{9}$, $.42\frac{6}{7}$
5. $.06\frac{1}{4}$, $.03\frac{1}{3}$, $.08\frac{1}{3}$, $.02\frac{1}{2}$, $.01$, $.03\frac{1}{8}$
6. $.4$, $.1$, $.6$, $.7$, $.8$, $.3$, $.9$, $.5$

Mixed decimals such as **1.25** and **1.05** can be changed to per cents by following the rules shown above:

$1.25 = 125\%$ $1.2 = 120\%$ $1.05 = 105\%$

Read the following as per cents:

1. 1.45 1.75 2.25 1.16 1.26
2. 1.2 1.6 1.4 1.8 1.5
3. 2.3 2.7 1.9 1.1 2.03

Just as $.25 = 25\%$ and $.04 = 4\%$
So also $25\% = .25$ and $4\% = .04$

$.35 = 35\%$
$35\% = .35$

$.05 = 5\%$
$5\% = .05$

$.20 = 20\%$
$20\% = .20$

$.06\frac{1}{4} = 6\frac{1}{4}\%$
$6\frac{1}{4}\% = .06\frac{1}{4}$

To express a per cent as a decimal:
Drop the per cent sign.
Move the decimal point **2** places to the left.
Add zeros to the left if necessary.
$15\% = .15$ $3\% = .03$ $115\% = 1.15$

Per cent is another way of saying *hundredths.*

Express as decimals:

1. 25% 18% 35% 30% 56%
2. 75% 98% 67% 45% 88%
3. 94% 16% 24% 86% 12%
4. 36% 27% 52% 91% 24%
5. 40% 60% 90% 80% 30%
6. 2% 1% 4% 8% 7%
7. 9% 7% 3% 6% 5%
8. 125% 175% 116% 112% 134%
9. 105% 104% 108% 106% 101%
10. 107% 102% 109% 103% 100%
11. $12\frac{1}{2}\%$ $16\frac{2}{3}\%$ $33\frac{1}{3}\%$ $66\frac{2}{3}\%$ $37\frac{1}{2}\%$
12. $11\frac{1}{9}\%$ $14\frac{2}{7}\%$ $87\frac{1}{2}\%$ $62\frac{1}{2}\%$ $83\frac{1}{3}\%$
13. $6\frac{1}{4}\%$ $3\frac{1}{3}\%$ $8\frac{1}{3}\%$ $3\frac{1}{8}\%$ $28\frac{4}{7}\%$
14. $2\frac{1}{2}\%$ $1\frac{3}{4}\%$ $2\frac{1}{4}\%$ $7\frac{1}{5}\%$ $5\frac{1}{2}\%$
15. $112\frac{1}{2}\%$ $116\frac{2}{3}\%$ $133\frac{1}{3}\%$ $162\frac{1}{2}\%$

% =100ths

Per Cent always means *hundredths*

$\frac{64}{100}$ = **64 hundredths** = **.64** = **64%**

$\frac{2}{100}$ = **2 hundredths** = **.02** = **2%**

$\frac{33\frac{1}{3}}{100}$ = **$33\frac{1}{3}$ hundredths** = **$.33\frac{1}{3}$** = **$33\frac{1}{3}$%**

$\frac{3\frac{1}{3}}{100}$ = **$3\frac{1}{3}$ hundredths** = **$.03\frac{1}{3}$** = **$3\frac{1}{3}$%**

LESSON 2.

Fractions With Denominators of 100

Change to per cents:

1. $\frac{25}{100}$ $\frac{32}{100}$ $\frac{16}{100}$ $\frac{75}{100}$ $\frac{92}{100}$

2. $\frac{28}{100}$ $\frac{45}{100}$ $\frac{35}{100}$ $\frac{81}{100}$ $\frac{72}{100}$

3. $\frac{95}{100}$ $\frac{82}{100}$ $\frac{20}{100}$ $\frac{30}{100}$ $\frac{50}{100}$

4. $\frac{10}{100}$ $\frac{70}{100}$ $\frac{60}{100}$ $\frac{80}{100}$ $\frac{40}{100}$

5. $\frac{90}{100}$ $\frac{8}{100}$ $\frac{7}{100}$ $\frac{1}{100}$ $\frac{3}{100}$

6. $\frac{2}{100}$ $\frac{4}{100}$ $\frac{6}{100}$ $\frac{9}{100}$ $\frac{5}{100}$

7. $\frac{12\frac{1}{2}}{100}$ $\frac{16\frac{2}{3}}{100}$ $\frac{33\frac{1}{3}}{100}$ $\frac{87\frac{1}{2}}{100}$

8. $\frac{11\frac{1}{9}}{100}$ $\frac{83\frac{1}{3}}{100}$ $\frac{37\frac{1}{2}}{100}$ $\frac{14\frac{2}{7}}{100}$

9. $\frac{6\frac{1}{4}}{100}$ $\frac{8\frac{1}{3}}{100}$ $\frac{3\frac{1}{3}}{100}$ $\frac{3\frac{1}{8}}{100}$

10. $\frac{2\frac{1}{2}}{100}$ $\frac{4\frac{1}{6}}{100}$ $\frac{2\frac{2}{3}}{100}$ $\frac{1\frac{3}{4}}{100}$

Supply the numerators:

1. $34\% = \frac{?}{100}$ $6\% = \frac{?}{100}$ $8\frac{1}{3}\% = \frac{?}{100}$

2. $18\% = \frac{?}{100}$ $3\% = \frac{?}{100}$ $3\frac{1}{3}\% = \frac{?}{100}$

3. $56\% = \frac{?}{100}$ $8\% = \frac{?}{100}$ $2\frac{1}{2}\% = \frac{?}{100}$

4. $75\% = \frac{?}{100}$ $4\% = \frac{?}{100}$ $6\frac{1}{4}\% = \frac{?}{100}$

Change to higher terms (hundredths) and express as per cents as is done in the example given:

$\frac{11}{25} = \frac{?}{100}$ $25\overline{)100}^{\;4}$ $4 \times 11 = 44$ $\frac{11}{25} = \frac{44}{100}$

$\frac{11}{25} = \frac{44}{100}$ = **44 hundredths** = **.44** = **44%**

1. $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{10}$ $\frac{1}{5}$ $\frac{2}{5}$

2. $\frac{3}{5}$ $\frac{4}{5}$ $\frac{1}{20}$ $\frac{3}{20}$ $\frac{7}{20}$

3. $\frac{9}{20}$ $\frac{1}{25}$ $\frac{2}{25}$ $\frac{3}{25}$ $\frac{4}{25}$

4. $\frac{3}{50}$ $\frac{7}{50}$ $\frac{9}{50}$ $\frac{13}{50}$ $\frac{17}{50}$

5. $\frac{6}{25}$ $\frac{7}{25}$ $\frac{8}{25}$ $\frac{9}{25}$ $\frac{1}{50}$

Change to decimals, then to fractions as is shown in the example given here:

34% = **34 hundredths** = **.34** = $\frac{34}{100}$

6. 19% 25% 36% 29%

7. 28% 39% 46% 41%

8. 51% 53% 59% 58%

9. 63% 68% 5% 8%

10. 4% 2% 3% 7%

Match Column B with Column A:

A	B
1. (?) $\frac{36}{100}$	(a) 75%
2. (?) $\frac{5}{100}$	(b) 50%
3. (?) $\frac{2}{100}$	(c) 36%
4. (?) $\frac{50}{100}$	(d) 5%
5. (?) $\frac{75}{100}$	(e) 2%

LESSON 3.

Changing Per Cents to Fractions

Study the examples given below:

per cent *decimal* *fraction* *lowest term*

$$25\% = .25 = \frac{25}{100} = \frac{1}{4}$$

$$20\% = .20 = \frac{20}{100} = \frac{1}{5}$$

$$5\% = .05 = \frac{5}{100} = \frac{1}{20}$$

Change the following per cents to fractions. Give each step as shown above. See that the fraction in the answer is in its lowest terms:

1. 30% 50% 40% 60% 80%
2. 10% 70% 90% 75% 25%
3. 35% 4% 2% 8% 6%
4. 7% 3% 1% 9% 5%
5. 12% 24% 16% 15% 45%
6. 28% 48% 65% 85% 32%

A fraction attached to a decimal takes its name from the figure to which it is attached.
.12 is read twelve hundredths
.12½ is read twelve and a half hundredths
.3⅓ is read three and a third tenths

To express a decimal such as $.3\frac{1}{3}$ or $.06\frac{1}{4}$ as a fraction involves complex fractions, e.g.,

A. $.3\frac{1}{3} = \dfrac{3\frac{1}{3}}{10}$ **B.** $.06\frac{1}{4} = \dfrac{6\frac{1}{4}}{100}$

In (A) the numerator is the mixed number $3\frac{1}{3}$
The denominator is the whole number **10**
10 may be written as $\frac{10}{1}$

$$\frac{3\frac{1}{3}}{10} = \frac{10}{3} \div \frac{10}{1} = \frac{10}{3} \times \frac{1}{10} = \frac{1}{3}$$

In (B) the numerator is the mixed number $6\frac{1}{4}$
The denominator is the whole number **100**
100 may be written as $\frac{100}{1}$

$$\frac{6\frac{1}{4}}{100} = \frac{25}{4} \div \frac{100}{1} = \frac{25}{4} \times \frac{1}{100} = \frac{1}{16}$$

$$33\tfrac{1}{3}\% = .33\tfrac{1}{3} =$$

$$\frac{33\frac{1}{3}}{100} = \frac{100}{3} \div \frac{100}{1} = \frac{100}{3} \times \frac{1}{100} = \frac{1}{3}$$

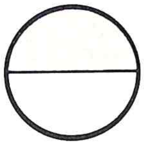
$$3\tfrac{1}{3}\% = .03\tfrac{1}{3} =$$

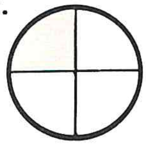
$$\frac{3\frac{1}{3}}{100} = \frac{10}{3} \div \frac{100}{1} = \frac{10}{3} \times \frac{1}{100} = \frac{1}{30}$$

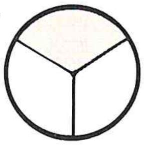
Change the following per cents to fractions. Give each step as shown above. See that the fraction in the answer is in its lowest terms:

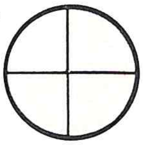
1. $6\frac{1}{4}\%$ $12\frac{1}{2}\%$ $18\frac{3}{4}\%$ $37\frac{1}{2}\%$
2. $6\frac{2}{3}\%$ $13\frac{1}{3}\%$ $26\frac{2}{3}\%$ $33\frac{1}{3}\%$
3. $66\frac{2}{3}\%$ $83\frac{1}{3}\%$ $93\frac{1}{3}\%$ $62\frac{1}{2}\%$
4. $53\frac{1}{3}\%$ $87\frac{1}{2}\%$ $31\frac{1}{4}\%$ $43\frac{3}{4}\%$
5. $5\frac{5}{9}\%$ $11\frac{1}{9}\%$ $22\frac{2}{9}\%$ $44\frac{4}{9}\%$
6. $8\frac{1}{3}\%$ $16\frac{2}{3}\%$ $4\frac{1}{6}\%$ $2\frac{1}{12}\%$

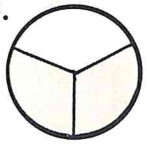
Give the percent value of the parts shaded in the diagrams below:

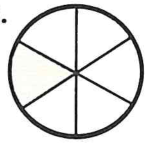
1.


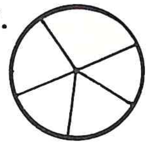
2.


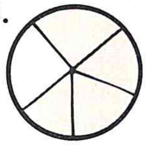
3.


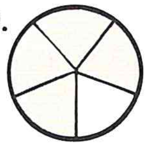
4.


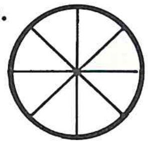
5.


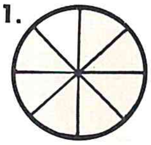
6.


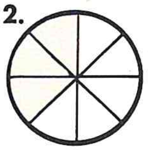
7.


8.


9.


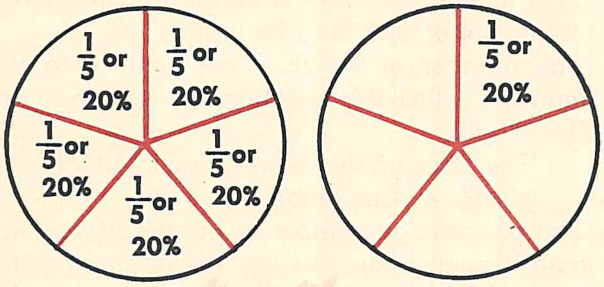
10.


11.


12.


LESSON 4. Per Cents Above 100

100% of anything means the *whole* of it.
So **100%** = **100** hundredths = $\frac{100}{100}$ = **1**



$\frac{5}{5}$ + $\frac{1}{5} = \frac{6}{5}$
1 + $\frac{1}{5} = 1\frac{1}{5}$
100% + **20% = 120%**

The *whole* of *anything* is equal to **1** or **1.00**

100% means **100** hundredths or **1.00**

20% means **20** hundredths or **.20**

120% means **120** hundredths or **1.20**

125% means **125** hundredths or **1.25**

104% means **104** hundredths or **1.04**

Express as decimals, then as fractions in lowest terms. Study the steps given:

125% = 1.25 = $1\frac{25}{100} = 1\frac{1}{4}$
104% = 1.04 = $1\frac{4}{100} = 1\frac{1}{25}$
200% = 2.00 = 2

Explain:

A. In a spelling test, Mary received **100%**. This means that Mary had every word correct.

Explain the following as shown in **A.**

1. Ruth's sweater is 100% wool.
2. John saved 100% of his allowance.
3. The attendance in Room 16 is 100%.
4. Ann ate 100% of her lunch.
5. Peter has read 100% of his new book.
6. Dominic's mark in arithmetic was 100%.
7. In the sixth grade 100% of the pupils say the Rosary each day.
8. 100% of the class voted for Anthony to be class president.

Commit to memory:

25% = $\frac{1}{4}$
50% = $\frac{1}{2}$
75% = $\frac{3}{4}$
10% = $\frac{1}{10}$
20% = $\frac{1}{5}$
30% = $\frac{3}{10}$
40% = $\frac{2}{5}$
60% = $\frac{3}{5}$
70% = $\frac{7}{10}$
80% = $\frac{4}{5}$
90% = $\frac{9}{10}$

$12\frac{1}{2}\%$ = $\frac{1}{8}$
$37\frac{1}{2}\%$ = $\frac{3}{8}$
$62\frac{1}{2}\%$ = $\frac{5}{8}$
$87\frac{1}{2}\%$ = $\frac{7}{8}$
$33\frac{1}{3}\%$ = $\frac{1}{3}$
$66\frac{2}{3}\%$ = $\frac{2}{3}$
$16\frac{2}{3}\%$ = $\frac{1}{6}$
$83\frac{1}{3}\%$ = $\frac{5}{6}$
$9\frac{1}{11}\%$ = $\frac{1}{11}$
$11\frac{1}{9}\%$ = $\frac{1}{9}$
$14\frac{2}{7}\%$ = $\frac{1}{7}$

1% = $\frac{1}{100}$
2% = $\frac{1}{50}$
4% = $\frac{1}{25}$
8% = $\frac{2}{25}$
12% = $\frac{3}{25}$
5% = $\frac{1}{20}$
15% = $\frac{3}{20}$
$6\frac{1}{4}\%$ = $\frac{1}{16}$
$8\frac{1}{3}\%$ = $\frac{1}{12}$
$3\frac{1}{3}\%$ = $\frac{1}{30}$
$6\frac{2}{3}\%$ = $\frac{1}{15}$

Give the answers orally:

1. If Ellen's coat cost \$30, we say that \$30 is ....(?)....% of the cost of Ellen's coat.
2. If $1\frac{1}{2}$ times the cost of Ellen's coat is \$48, we say that \$48 is ....(?)....% of the cost of Ellen's coat.
3. If $1\frac{3}{4}$ times the cost of Ellen's coat is \$56, we say that \$56 is ....(?)....% of the cost of Ellen's coat.

LESSON 5.

Applying Per Cents

1. Dominic earned **$24** working after school. He spent $\frac{1}{4}$ of it for a camera. How much did he spend for the camera?

   Find $\frac{1}{4}$ of **$24**

2. Dominic earned **$24** and spent **.25** of it. How much did he spend?

   Find **.25** of **$24**

3. Dominic earned **$24** and spent **25%** of it. How much did he spend?

   Find **25%** of **$24** which may be expressed either **.25** of **$24** or $\frac{1}{4}$ of **$24.** The answer is **$6.**

   Dominic spent **$6** for the camera.

A per cent must be changed to a decimal or to a fraction before it can be used in a problem.

100% of a number equals the number.

Less than **100%** of a number is less than the number.

More than **100%** of a number is more than the number.

100% of **16** is **1 × 16** or **16**
75% of **16** is **.75 × 16** or **12**
125% of **16** is **1.25 × 16** or **20**

Explain orally as shown below in **A:**

To find

A. **15%** of **60** is to find **.15 × 60** or $\frac{3}{20} \times \frac{60}{1}$

1. 20% of 45 is to find.................?.................
2. 25% of 65 is to find.................?.................
3. 75% of 50 is to find.................?.................
4. 50% of 100 is to find.................?.................
5. 10% of 90 is to find.................?.................
6. 5% of 40 is to find.................?.................

Ann had **$35.** She spent **24%** of it for school supplies. How much did she spend?

This means that **$35** is to be multiplied by **.24** or **.24** of **$35** is to be found.

The number of which a per cent is to be found is called the *base* because it represents the Whole.

The Base or the Whole equals **100%**
100% of Ann's money is **$35.**

The per cent or number of hundredths to be found is called the *rate per cent* or simply the *rate.*

The result obtained by multiplying the base by the rate is called the *percentage.*

Therefore:

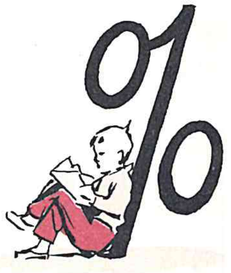
Percentage = base × rate

This rule fits into our basic principle.

Product = factor × factor
Percentage = base × rate
? = **$35** × **.24**
Check: **$8.40** = **$35** × **.24**

Show the work this way:

$35 = the base
.24 = the rate
1 40
7 0
$8.40 = the percentage



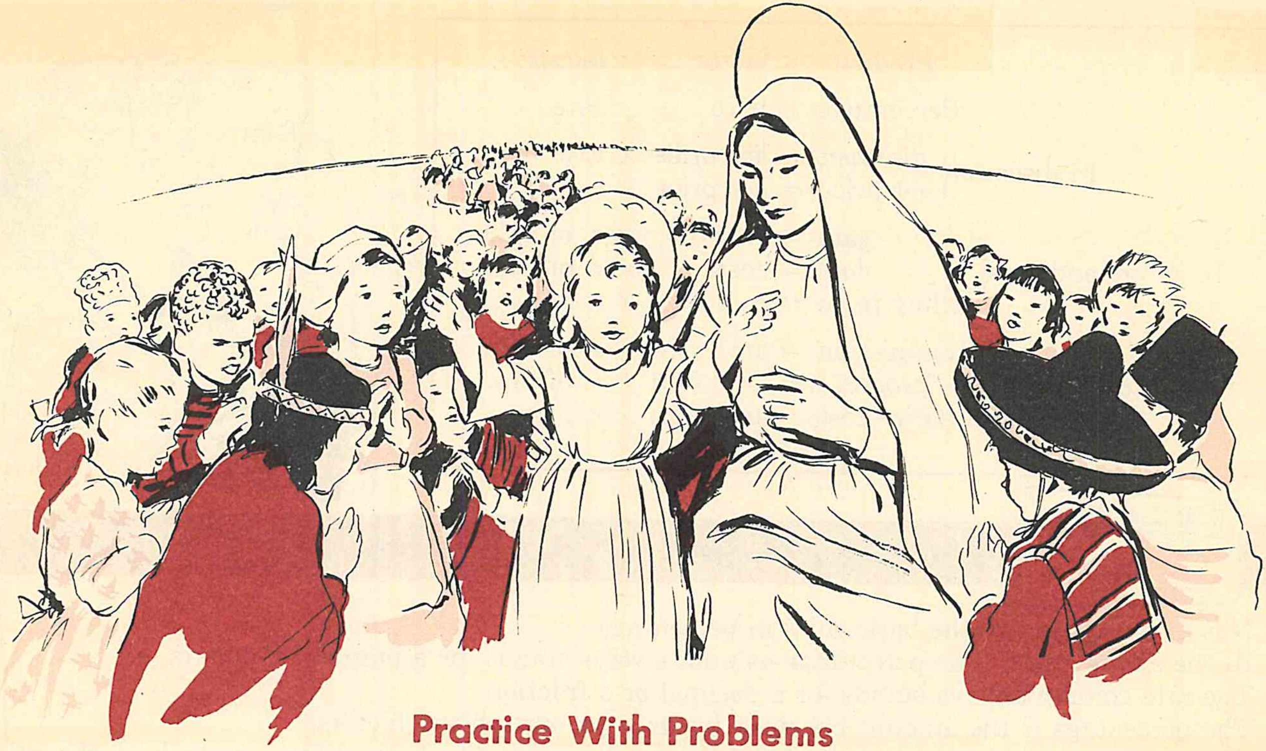
Solve the following by using the rate as a decimal:

1. 25% of 120 = ? 90% of 72 = ?
2. 40% of 80 = ? 60% of 75 = ?
3. 75% of 120 = ? 80% of 72 = ?
4. 16% of 35 = ? 30% of 90 = ?
5. 24% of 65 = ? 32% of 25 = ?

Remember:

When one factor is less than **1,** the product is less than the other factor, as

P = f × f
9 = 12 × .75



Practice With Problems

Solve:

1. Of the 200,000 pagan babies born during a recent year only 25% were baptized in any Christian faith. How many were baptized?

2. The first collection ever made by the Society for the Propagation of the Faith amounted to $4000. If $33\frac{1}{3}\%$ of this amount was given to Louisiana, how much was left for other missions?

3. Father Murray ordered 12 canoes for his mission helpers. The canoes were listed at $125 each, but Father received a 30% discount. How much did the canoes cost him?

4. In order to encourage better living among the natives at his mission Father Phelan planned to have them sell goods at a commission. One native sold soap and cooking utensils to the amount of $60. If Father gave him $12 commission, what rate was this?

5. The children of Our Lady School bought novelties to resell for the missions. They purchased $390 worth and sold them at 40% profit. How much profit had they for the missions?

6. The children in our class collected $90 this year for the missions. If the entire school collected $540, what per cent did our class collect?

7. On a Mercy trip by plane, the missionary priests in Alaska were able to save 480 Eskimos who were stricken with illness. If this was $\frac{1}{8}$ of the total population of the settlement, what was the population?

8. The children of St. Francis School ransomed 125 pagan babies last year. This year they hope to increase this number by 20%. If they succeed, how many babies will they ransom this year?

9. Sister Mary Carol purchased text books for her mission school. If she received a donation of $40 which was $\frac{1}{7}$ of the cost, how much did the books cost?

10. In one day Father McSorley traveled 30 miles by bicycle. If this was $\frac{1}{6}$ of the length of his mission territory, how many more miles had he to cover?

	Product	=	factor	×	factor
	Percentage	=	base	×	rate
In discount	discount	=	list price	×	r. of disc.
	net price	=	list price	×	r. of n.p.
In profit and loss	gain	=	cost	×	r. of gain
	loss	=	cost	×	r. of loss
	selling price	=	cost	×	r. of s.p.
In commission	commission	=	am't sold	×	r. of com.
	proceeds	=	am't sold	×	r. of pro.
	entire cost	=	am't pur.	×	r. of e.c.

LESSON 10

Summary of Rules

Note—the above are the basic rules in percentage.

In the above chart: The percentage column always stands for a number of dollars.

The rate column always stands for a decimal or a fraction.

The percentage is the amount obtained by multiplying the two factors.

The percentage and rate always contain a word common to both. When we look at the rules given above, we must be able to give the reversals, then we have only the basic rules to remember.

$$\text{r. of d.} = \frac{\text{disc.}}{\text{l.p.}} \qquad \text{r. of g.} = \frac{\text{gain}}{\text{cost}} \qquad \text{r. of c.} = \frac{\text{com.}}{\text{am't pur.}} \qquad \text{r. of c.} = \frac{\text{com.}}{\text{am't sold}}$$

Measure Your Progress in Percentage

Part I

Do you know which are factors; which are products? e.g. (a) discount = *product* (b) r. of disc. = *factor*.

Tell whether each term is a factor or product.

1.	list price	....?....	r. of com.	....?....
2.	am't pur.	....?....	r. of gain	....?....
3.	r. of s.p.	....?....	selling p.	....?....
4.	marked price	....?....	proceeds	....?....
5.	c. on ent. c.	....?....	am't sold	....?....
6.	ent. cost	....?....	r. of n.p.	....?....
7.	am't collected	....?....	r. of pro.	....?....
8.	r. of loss	....?....	am't bought	....?....
9.	original price	....?....	net price	....?....
10.	entire cost	....?....	r. of ent. cost	....?....

Part II

Give the answers orally:

1. To find the rate .....(?)..... the percentage by the .....(?)......

2. To find the percentage .....(?)..... the base by the .....(?)......

3. When goods are sold above the cost, the rate of selling is .....(?)..... than 100%.

4. When goods are sold below the cost, the rate of selling is .....(?)..... than 100%.

5. In commission problems, the .....(?)..... is the amount left after expenses have been paid.

6. The rate of proceeds is always .....(?)..... than 100%.

7. The rate of entire cost is always.....(?)..... than 100%.

8. In the chart given on this page, the base column always represents money, and it is always a .....(?)..... (factor or product).

Part III

Find the answers:

1. ....?........ = 125% of 210.
2. ....?........ = $33\frac{1}{3}$% of 270.
3. ....?........ = 150% of 36.
4. 30 is ....?........ % of 120.
5. 80 is ....?........ % of 200.
6. 115% of 200 = ...?........
7. 52 = ...?........ % of 312.
8. $4\frac{1}{2}$% of 400 = ...?........
9. 2 oz. = ...?........ % of 1 lb.
10. $12\frac{1}{2}$% of 104 = ...?........

Part IV

1. Mary is driving to her uncle's home 12.6 miles away. When she has driven $16\frac{2}{3}$% of the distance, how many miles has she covered?
2. The boys on the basketball team lost 30% of the $60 they had saved for supplies. How much money did they lose?
3. Gas was discovered in the Oriskany sand in Tioga County in 1930. Since then 15 new fields have been started, but 10 of them are now used up. What per cent of the number of gas fields started are now used up?
4. One school ransomed 27 pagan babies in one month. A second school ransomed 9 babies. What per cent of the total number of ransomed babies was the number ransomed by the second school?
5. In a game of horseshoes Bob made 10 points out of 25 throws. What per cent of the number of throws were the number of points made?
6. What is the difference between $12\frac{1}{2}$% of $24, and $16\frac{2}{3}$% of $24?
7. Add 25% of 30.4 to $16\frac{2}{3}$% of 42.6.
8. Take $8\frac{1}{3}$% of 120 from $12\frac{1}{2}$% of 96.
9. Multiply $6\frac{2}{3}$% of 75 by $3\frac{1}{3}$% of 120.
10. Divide $33\frac{1}{3}$% of 19.5 by $14\frac{2}{7}$% of 35.

Part V

1. A lumber dealer had $150,000 worth of lumber in the yard. The damage done by a recent fire amounted to $33,000. What per cent of the value of the lumber was the damage?
2. The selling price of a washing machine was $140.25. The cost was $165. What was the rate of loss?
3. What is the gain on an article bought for $60, if the overhead is $4, and the rate of gain is $3\frac{1}{2}$%?

Read the following problem and answer the questions below it.

4. Bertha has 160 stamps in her album. If 15% of these stamps are foreign, how many are not foreign?
   (a) What % represents all of Bertha's stamps?
   (b) What % represents the foreign stamps?
   (c) What % represents the stamps that are not foreign?
   (d) What is the hidden question?
5. Mr. Jones earns $2880 a year. If he rents a house for $60 a month, what per cent of his earnings does he pay for rent?
6. A certain department store allows a 4% reduction for cash. At this rate what is the selling price of dresses marked $20.25?
7. After paying an agent's commission of $295.50 for selling a house, the owner receives $9554.50. What rate of commission does the agent receive?
8. Find the selling price of 40 coats that cost $24 each, if the rate of gain is 15%.
9. The list price is $42, net price $38.64. What is the rate of discount?
10. The amount collected is $980, commission $58.80. What is the rate of commission?

UNIT 7 TEST Write the answers in your notebook:

Part I

Match Column B with Column A

Column A	Column B
1. (?) .04	(a) 100%—r. of com.
2. (?) $.03\frac{1}{2}$	(b) 110%
3. (?) r. of proceeds	(c) $\frac{1}{25}$
4. (?) .2	(d) $\frac{1}{11}$
5. (?) 1.1	(e) $\frac{1}{12}$
6. (?) .08	(f) .035
7. (?) $9\frac{1}{11}\%$	(g) $2\times\frac{1}{8}$
8. (?) $16\frac{2}{3}\%$	(h) $2\times\frac{1}{25}$
9. (?) 25%	(i) .20
10. (?) $8\frac{1}{3}\%$	(j) $2\times\frac{1}{12}$

Part II

1. When goods costing $160 plus $20 overhead, are sold for $210, what is the rate of gain?
2. When merchandise bought for $200 is sold for $190, what is the rate of loss?
3. What is the selling price when the rate of gain is $16\frac{2}{3}\%$ and the cost is $1.80?
4. What is the selling price when the rate of loss is 5% and the cost is $80?
5. The percentage is $.41, and the base is $16.40. What is the rate per cent?
6. What is the commission when the amount collected is $600 and the rate of commission is $3\frac{1}{2}\%$?
7. Find the proceeds when the amount sold is $800, and the rate of commission is 8%.
8. Find the rate of commission when the proceeds are $644.48 and the amount collected is $678.40.
9. Find the rate of gain when the selling price is $112.32 and the cost is $104.
10. Find 120% of 5.
11. If the cost is $500 and the selling price is $600, what is the rate of gain?
12. Find the commission at 4% on a bill of goods sold for $3500.

Part III

1. Supply the numerators:

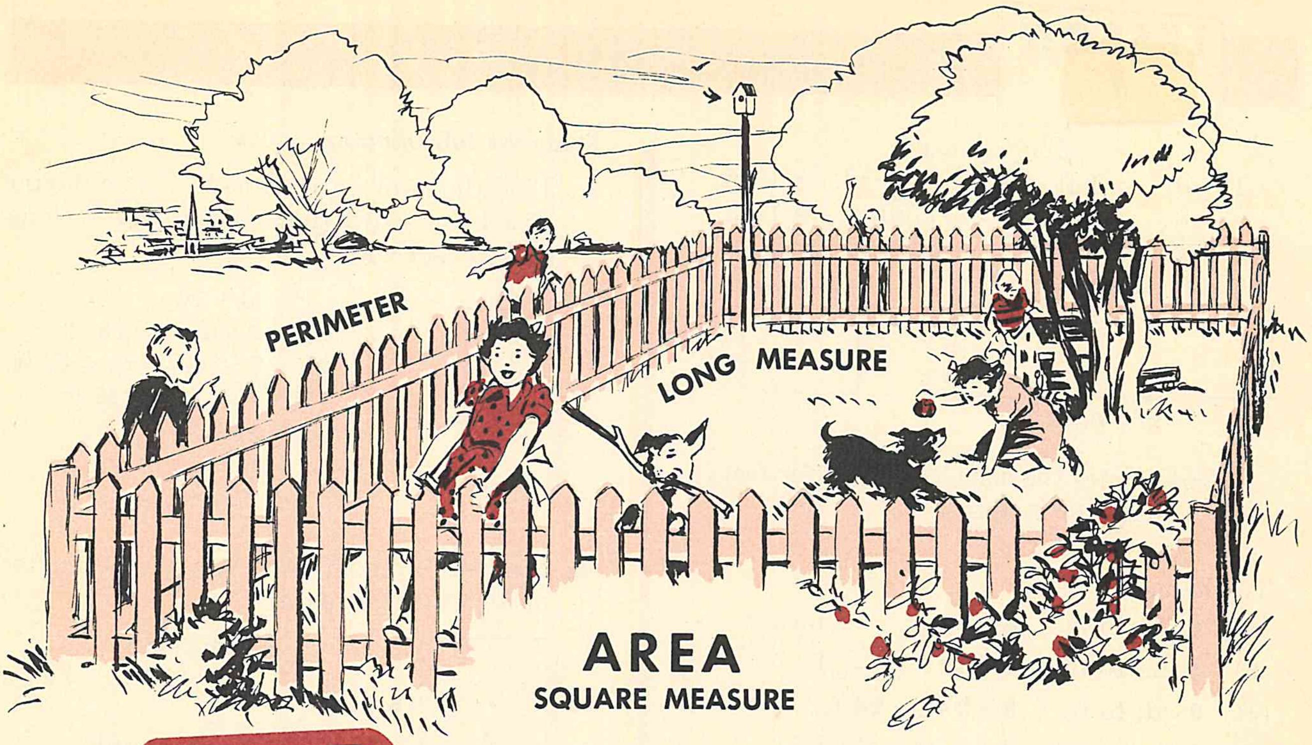
   $40\% = \frac{?}{100}$ $3\frac{1}{3}\% = \frac{?}{100}$ $150\% = 1\frac{?}{100}$

   $66\frac{2}{3}\% = \frac{?}{100}$ $125\% = 1\frac{?}{100}$ $9\frac{1}{11}\% = \frac{?}{100}$

2. Express as decimals:
   25%, 5%, 20%, 2%, 120%, 102%, $8\frac{1}{3}\%$
3. Express as per cents:
   .25, $.02\frac{1}{2}$, .025, .4, 1.15, 1.1
4. Express as fractions in their lowest terms:
   $16\frac{2}{3}\%$, $6\frac{1}{4}\%$, $37\frac{1}{2}\%$, $6\frac{2}{3}\%$, $11\frac{1}{9}\%$, $14\frac{2}{7}\%$
5. Express as percents:
   $\frac{1}{20}$, $1\frac{1}{20}$, $\frac{1}{8}$, $\frac{1}{3}$, $\frac{1}{30}$, $\frac{1}{6}$, $1\frac{1}{6}$

Part IV

1. An agent sold automobile accessories amounting to $1120 in one week. If he received $44.80 commission, what rate of commission was he paid?
2. A dealer bought a chest for $31, and sold it at a gain of 18%. What was the selling price?
3. An auctioneer works for $30 a week plus a commission of 4% on sales. This week his total sales amount to $708.25. What has he earned this week?
4. Mr. Moore bought a shipment of fruit for $960. Because of its condition, he had to sell it at a loss of $12\frac{1}{2}\%$. How much did Mr. Moore lose?
5. At what rate of loss is a rug sold if it costs $50 and is sold for $45?
6. An automobile salesman sold a used car for $960. The proceeds to the dealer after the agent's commission was deducted was $768. Find the rate of the agent's commission.



UNIT 8 • WORKING WITH MEASURES

How Well Do You Remember?

Give the answers orally:

1. The measure used to measure lines is (?) long measure.

2. The distance around a figure is called (?) perimeter

3. Perimeter is measured by (?) long measure.

4. The distance around a rectangle is equal to its length plus its width plus its length plus its (?) width

5. A short way of telling how to find the perimeter of a square is: P = 4 (?) s.

6. The number of inches in the perimeter of a rectangle that measures 14 inches long and 10 inches wide is (?) 48"

7. To change 48 inches to feet, ÷ (?) 48 by 12 (?). To change 48 inches to yards ÷ (?) 36 48 by (?) 36.

8. To change 6 feet to inches, (?) x 6 by 12 (?).

9. To change 6 yards to feet, (?) × 6 by 3 (?).

10. To find the area of a rectangle, (?) x the number of units in the length by the number of units in the (?) width

11. A short way of telling how to find the area of a square is: A = s (?) x s.

12. To change 200 square inches to square feet, (?) ÷ 200 by (?) 144

13. To change 48 square feet to square yards, ÷ (?) 48 by (?) 9.

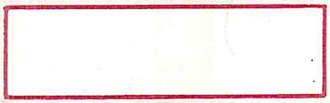
14. If l = 5 in. and w = 4 in.,
P = (?) 18 inches
A = (?) 20 square inches.

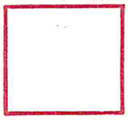
LESSON 1. Perimeters

Long Measure

12 in. = 1 ft.
3 ft. = 1 yd.
$5\frac{1}{2}$ yd. = 1 rd.
$16\frac{1}{2}$ ft. = 1 rd.

320 rd. = 1 mi.
1760 yd. = 1 mi.
5280 ft. = 1 mi.


rectangle


square

Sometimes the sign (′) is used for feet, (″) is used for inches.

To change:

(a) **6** ft. to in. $\mathbf{6 \times 12}$ in. $= \mathbf{72}$ inches
(b) **6** in. to ft. $\mathbf{6 \div 12} = \frac{6}{12} = \frac{1}{2}$ ft.
(c) **8** yd. to ft. $\mathbf{8 \times 3}$ ft. $= \mathbf{24}$ ft.
(d) **8** ft. to yd. $\mathbf{8 \div 3} = \frac{8}{3} = \mathbf{2\frac{2}{3}}$ yd.
(e) **10** rd. to yd. $\mathbf{10 \times 5\frac{1}{2}}$ yd. $= \frac{10}{1} \times \frac{11}{2} = \mathbf{55}$ yd.
(f) **10** yd. to rd. $\mathbf{10 \div 5\frac{1}{2}} = \frac{10}{1} \times \frac{2}{11} = \mathbf{1\frac{9}{11}}$ rd.
(g) $\mathbf{1\frac{1}{2}}$ mi. to rd. $\mathbf{1\frac{1}{2} \times 320}$ rd. $= \frac{3}{2} = \frac{320}{1} = \mathbf{480}$ rd.
(h) **40** rd. to mi. $\mathbf{40 \div 320} = \frac{40}{320} = \frac{1}{8}$ mi.

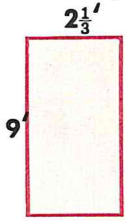
Change:

1. $1\frac{1}{2}$ ft. to in. = 15″ 30 in. to ft. = 2½′
2. 4 rd. to yd. 22 yd. $5\frac{1}{2}$ yd. to rd. = 1 rod
3. 18 in. to ft. 1½ ft. 160 rd. to mi. ½ mi
4. 45 rd. to yd. 247-½ yd. 24 yd. to ft. 72′
5. 10 ft. to yd. 3⅓ yd 18 yd. to rd. 3 3/11 rod
6. 2 mi. to rd. 640 rd. 8 ft. to in. 96″
7. 36 in. to yd. 1 yd 2 yd. to in. 72″
8. What fractional part of 1 yd. is 1 ft.? ⅓
9. What fractional part of 1 ft. is 8 in.? ⅔
10. How many pieces of wire 16 inches long can be cut from a piece $5\frac{1}{3}$ ft. long? 4 4
11. What per cent of 8 feet is 2 yards? 75%
12. What per cent of 2 yards is 48 inches? 66⅔%

Perimeter of a rectangle = 2l + 2w
Perimeter of a square = 4 × Side

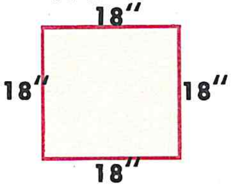
Study the following examples:

A. Find the number of yards in the perimeter of a blackboard that measures **9** ft. long and $\mathbf{2\frac{1}{3}}$ feet wide.



$$
\begin{aligned}
P &= 2l + 2w \\
2l &= \mathbf{2 \times 9} \text{ ft.} = \mathbf{18} \text{ ft.} \\
2w &= \tfrac{2}{1} \times \tfrac{7}{3} \text{ ft.} = \tfrac{14}{3} = 4\tfrac{2}{3} \text{ ft.} \\
P &= \mathbf{18 + 4\tfrac{2}{3} = 22\tfrac{2}{3}} \text{ ft.} \\
\text{no. yd.} &= \mathbf{22\tfrac{2}{3} \div 3} \\
&= \tfrac{68}{3} \times \tfrac{1}{3} = \tfrac{68}{9} \text{ yd.} \\
&= \mathbf{7\tfrac{5}{9}} \text{ yd. result.}
\end{aligned}
$$

B. Find the number of feet in the perimeter of an **18** inch square.



$$
\begin{aligned}
P &= 4 \times \text{side} \\
&= \mathbf{4 \times 18} \text{ in.} = \mathbf{72} \text{ in.} \\
\text{no. ft.} &= \tfrac{72}{12} \\
&= \mathbf{6} \text{ ft. result.}
\end{aligned}
$$

Find P when:

1. l = 15 in. = 46″ w = 8 in.
2. l = 12 in. 42 w = 9 in.
3. l = $2\frac{1}{2}$ ft. 11½ w = $3\frac{1}{4}$ ft.
4. l = $5\frac{1}{2}$ ft. 20′ w = $4\frac{1}{2}$ ft.
5. l = 7 in. 31″ w = $8\frac{1}{2}$ in.

Find P when:

6. 13 s = $3\frac{1}{4}$ in.
7. 10 s = $2\frac{1}{2}$ ft.
8. 12½ s = $3\frac{1}{8}$ yd.
9. 24″ s = 6 in.
10. 40″ s = 10 in.

Solve the following:

1. Find the number of feet of framing required for a picture 18 inches by 10 inches. 11⅔′
2. Find the perimeter of a 16-inch square. Give your answer in feet. 5⅓
3. A field 24 rd. by 16 rd. is to be fenced with an iron fence. How many rods of fencing are needed? 80 rd.
4. How many yards of edging are needed for a cover 4 feet by 3 feet? 4⅔
5. Find the total distance in yards around a floor 18 ft. long and 15 feet wide. 22 yd

LESSON 2.

Areas

Square Measure

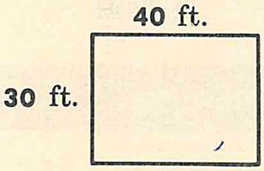
144 sq. in. = **1** sq. ft.
9 sq. ft. = **1** sq. yd.
30¼ sq. yd. = **1** sq. rd.
160 sq. rd. = **1** acre
640 acres = **1** sq. mi.

The area of any figure is equal to the number of square units it contains

Formula for finding the area of a rectangle may be expressed:	Formula for finding the area of a square may be expressed
A = lw or A = l × w	A = s × s

Study this example:

Find the number of square yards in a lot **40** ft. long and **30** ft. wide.



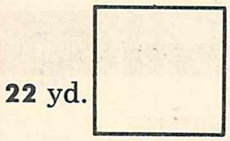
$A = l \times w$
$= \mathbf{40 \times 30}$
$= \mathbf{1200}$ sq. ft.
no. sq. yd. in area $= \frac{1200}{9} = \mathbf{133\frac{1}{3}}$

$= \mathbf{133\frac{1}{3}}$ sq. yd.

Result **133⅓** sq. yd.

Study this example:

Find the number of square rods in a square field 22 yd. on a side.



$A = s \times s$
$= \mathbf{22 \times 22}$
$= \mathbf{484}$ sq. yd.
No. of sq. rd. in A. $= \mathbf{484 \div 30\frac{1}{4}}$

$$= \frac{\overset{4}{\cancel{484}}}{1} \times \frac{4}{\underset{1}{\cancel{121}}} = \frac{16}{1}$$

$= \mathbf{16}$ sq. rd.

Result **16** sq. rd.

Give the answers orally:

1. To change 80 sq. in. to sq. ft. ÷ (?) 80 by (144). The answer will be a fraction in its lowest terms with a denominator of 9 (?) and a numerator of (?) 5.
2. To change 30 sq. ft. to sq. yd., ÷ (?) 30 by 9 (?). The answer will be (?) 3 1/3
3. To change 121 sq. yd. to sq. rd., ÷ (?) 30 1/4 121 by (?). The answer will be (?) 4 sq rd
4. To change 120 sq. rd. to acres, ÷ (?) 160 120 by 160 (?). The answer will be (?) 3/4
5. To change 2 acres to sq. rd. × (?) 2 by (?) 160 The answer will be (?) 320 sq rd
6. To change 6 sq. yd. to sq. ft. × (?) 6 by 9. The answer will be (?)

Find A when

1. l = 18 ft. w = 15 ft. Answer in sq. yd. 30
2. l = 11 yd. w = 6 yd. Answer in sq. rd. 2 2/11
3. l = 40 rd. w = 10 rd. Answer in acres. 2 1/2
4. l = 20 in. w = 1½ ft. Answer in sq. ft. 2 1/2
5. l = 5⅓ yd. w = 10 ft. Answer in sq. ft. 160
6. A square lot 40 rods long contains how many acres? 10
7. How many sq. yd. of linoleum are needed to cover a floor 16 ft. by 12 ft.? 21 1/3
8. How many squares 2 feet on a side can be cut from a piece of felt 18 feet long, 12 ft. wide? 54 ÷4
9. How many square yards of the living room floor are covered by a rug 15 ft. by 12 ft.? 20
10. Find the area and the perimeter of a square table 3½ feet on a side. 14 12 1/4

Dry

2 pt. = **1** qt.
8 qt. = **1** pk.
4 pk. = **1** bu.

Liquid

2 cupfuls = **1** pt.
2 pints = **1** qt.
4 quarts = **1** gal.

Time

60 sec. = **1** min.
60 min. = **1** hr.
24 hr. = **1** da.
7 da. = **1** wk.
12 mo. = **1** yr.
365 da. = **1** yr.
366 da. = **1** leap year
100 yr. = **1** century

Weight

16 oz. = **1** pound
100 lb. = **1** cwt.
20 cwt. = **1** ton

Counting

12 things = **1** dozen
12 doz. = **1** gross
144 things = **1** gross

To change from pints to quarts is to change from a lower to a higher denomination.
You will have fewer for your answer—6 pt. (lower) =3 qt. (higher) L H D
To change from bushels to pecks is to change from a higher to a lower denomination.
You will have more for your answer—3 bu. (higher) = 12 pk. (lower) H L M

LESSON 3

Measures

Change the following measures:

1. 3 qt. = 6 ? pt.
2. 8 pt. = 4 ? qt.
3. 4 gal. = 16 ? qt.
4. 8 qt. = 2 ? gal.
5. 12 pk. = 3 ? bu.
6. 16 qt. = 4 ? pk.
7. 6 bu. = 24 ? pk.
8. 12 pt. = 6 ? qt.
9. 30 oz. = 1 7/8 ? lb.
10. 1 wk. 6 da. = 13 ? da.
11. 2 ft. 1 in. = 25 ? in.
12. 1 yd. 2 ft. = 5 ? ft.
13. 1 bu. 2 pk. = 6 ? pk.
14. 1 gal. 1 qt. = 5 ? qt.
15. 14 qt. = 56 ? $\frac{1}{2}$ pt.
16. 18 doz. = 1 1/2 ? gross
17. $\frac{1}{2}$ acre = ? sq. rd.
18. 3 sq. yd. = ? sq. ft.

Addition—Compound Numbers

Add
9 ft. **6** in.
3 ft. **9** in.
13 ft. **3** in.

Add the inches, **9 + 6 = 15**
15 in. = **1** ft. **3** in.
Write **3** in. under in. and carry **1** ft. to the next column.
Add the feet,
1 + 3 + 9 = 13

1. Add 12 min. 47 sec. / 31 min. 28 sec. 9 da. 16 hr. / 10 da. 10 hr.

2. Add 6 gal. 3 qt. / 4 gal. 2 qt. 3 bu. 2 pk. / 6 bu. 3 pk.

Multiply
6 min. **8** sec.
×**9**
55 min. **12** sec.

1. Multiply **8** sec. by **9.**
9 × 8 = 72 sec.
Change **72** sec. to **1** min. **12** sec.
Write **12** sec. in the product under sec. and keep the **1** to carry.

2. Multiply 6 min. by **9** **9 × 6 = 54** min.
54 min. plus the **1** carried equals **55** min.
Write **55** min. in the product under min.

Multiply:

1. 3 wk. 4 da. by 9 2 yr. 4 mo. by 7
2. 7 da. 5 hr. by 6 7 min. 10 sec. by 8
3. 4 gal. 2 qt. by 8 8 lb. 9 oz. by 6
4. 6 bu. 2 pk. by 5 6 yd. 2 ft. by 8
5. 8 ft. 5 in. by 9 2 yr. 4 mo. by 5
6. Find the combined lengths of two sticks whose lengths are 4 yd. 2 ft. and 6 yd. 2 ft.
7. If we use 1 gal. 1 qt. of ice cream to serve one group of children, how much do we need to serve 10 groups if there are the same number in each group?
8. Find the time John spends in school on three consecutive days—Monday 5 hr. 40 min., Tuesday 5 hr. 45 min., Wednesday 5 hr. 45 min.
9. Mother has 1 lb. 8 oz. of steak for today's dinner. At this rate, how much will she use for 3 days?
10. One turkey weighed 18 lb. 9 oz. and another weighed 16 lb. 10 oz. What was their combined weight?

LESSON 4

Compound Measures

If a coil of wire contained 30 feet 2 inches of wire, and 18 feet 4 inches were taken off, we can find the amount remaining by compound subtraction, e.g.

30 feet **2** inches — the original amount
18 feet **4** inches — the amount used

In order to subtract we must borrow **1** foot from **30** feet, leaving **29** feet instead of **30** feet. The **1** foot borrowed equals **12** inches. Add the **12** in. to the **2** in., and rearrange the example.

29 feet **14** inches
18 feet **4** inches
11 feet **10** inches

There are **11** feet **10** inches of wire remaining.

1. David's fishing rod is 7 ft. 4 in. long. Paul's is 9 ft. 2 in. long. How much longer is Paul's than David's?
2. When Mary began to study her lessons she saw the time was 6:50. She worked until 8:10. How much time did she give to her lessons?
   (Subtract 6 hr. 50 min. from 8 hr. 10 min.)
3. From 6 lb. 4 oz. take 2 lb. 8 oz.
4. From 5 gal. 1 qt. take 2 gal. 3 qt.
5. From 6 yr. 2 mo. take 4 yr. 8 mo.
6. From 4 bu. 1 pk. take 2 bu. 3 pk.
7. From 7 yd. 1 ft. take 4 yd. 2 ft.
8. From 3 wk. 2 da. take 1 wk. 5 da.
9. From 2 tons 4 cwt. take 1 ton 12 cwt.
10. From 6 min. 1 sec. take 2 min. 8 sec.
11. From 5 bu. 2 pk. take 3 bu. 3 pk.
12. From 7 gal. take 4 gal. 3 qt.
13. From 4 yr. 3 mo. take 1 yr. 8 mo.
14. From 8 lb. 11 oz. take 2 lb. 13 oz.
15. From 7 wk. 3 da. take 3 wk. 5 da.

Helen has a piece of ribbon **6** yd. **2** ft. long. She wants to cut it into 4 equal parts. How long will each piece be?

To find the answer divide **6** yd. **2** ft. by **4**.

$$4\overline{)\mathbf{6}\text{ yd. }\mathbf{2}\text{ ft.}}$$

When we divide **6** yd. by **4**, we have **1** and **2** over. Change the **2** yd. that are over to **6** ft. Add **6** ft. to **2** ft. and we have **8** feet.

So the example may be rearranged to:

$$\begin{array}{r} \mathbf{1}\text{ yd. }\mathbf{2}\text{ ft.} \\ 4\overline{)4\text{ yd. }\mathbf{8}\text{ ft.}} \end{array}$$

Each piece of ribbon will be **1** yd. **2** ft.

Prove by doing the above example fractionally.

$$\mathbf{6}\text{ yd. }\mathbf{2}\text{ ft.} = 6\tfrac{2}{3}\text{ yd.}$$

$$6\tfrac{2}{3} \div 4 = \frac{\overset{5}{\cancel{20}}}{3} \times \frac{1}{\underset{1}{\cancel{4}}} = \frac{5}{3} = 1\tfrac{2}{3}\text{ yd.}$$

Divide by compound division:

1. $5\overline{)6\text{ hr. }15\text{ min.}}$ $3\overline{)6\text{ lb. }12\text{ oz.}}$
2. $4\overline{)9\text{ yr. }4\text{ mo.}}$ $2\overline{)21\text{ min. }12\text{ sec.}}$
3. $5\overline{)4\text{ ft. }2\text{ in.}}$ $4\overline{)6\text{ yd. }2\text{ ft.}}$
4. $3\overline{)10\text{ qt. }1\text{ pt.}}$ $4\overline{)9\text{ hr. }12\text{ min.}}$
5. $2\overline{)3\text{ acres }10\text{ sq. rd.}}$ $6\overline{)13\text{ lb. }2\text{ oz.}}$
6. At a sale, Alice bought 2 pieces of silk. One piece was 2 yd. 16 in. long, and the other was 1 yd. 28 inches long. How much had Alice in the two pieces of silk?
7. Mr. Jones left one airport at 9:45 A.M. and reached his destination at 11:15 A.M. How long was he in the plane?
8. Betty used 2 ft. 8 in. of trimming for a dress she made. If Betty had made two dresses of the same kind, how much trimming would she have used?
9. Mary Ellen had 3 yd. 4 in. of lace which she cut into 2 pieces. How long was each piece?
10. Divide 6 lb. 12 oz. by 9.

LESSON 5.

Scale Drawings

A scale drawing is a reduced size drawing of something which cannot be shown in its full size. For example, a map is a picture of a section of the earth whose full size cannot be shown on paper. The scale used may be: $\frac{1}{4}$ inch represents **100** miles. The dimension **500** miles would be $\frac{500}{100} \times \frac{1}{4} = \frac{5}{4}$ or $1\frac{1}{4}$ inches.

If $\frac{1}{8}$ inch represents 50 miles how many miles do the following represent?

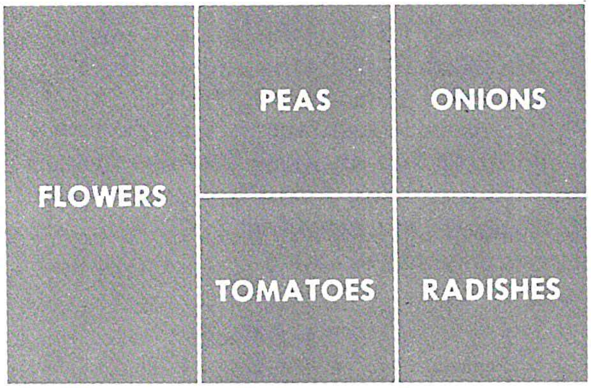
1. $\frac{3}{8}$ in.
2. $\frac{5}{8}$ in.
3. $\frac{7}{8}$ in.
4. $1\frac{1}{8}$ in.
5. $1\frac{5}{8}$ in.

If $\frac{1}{5}$ inch represents 100 miles, how many inches will represent:

1. 300 mi.
2. 400 mi.
3. 500 mi.
4. 600 mi.
5. 750 mi.

Answer the following:

1. The scale of a house plan is 1″ = 1′. A living room 20 ft. x 36 ft. would be how many inches long and how many inches wide?
2. Using a scale of $\frac{1}{2}$ in. = 1 ft. a line $6\frac{3}{4}$ in. represents how many feet?
3. A road map has a scale of 1 in. = 50 mi. The distance between two towns on the map scales $3\frac{1}{2}$ in. How far apart are the towns?
4. A window measures $1\frac{3}{4}$″ long on a plan. What is the actual length if the scale is $\frac{1}{2}$″ = 1 foot?
5. The floor of a room is 12 ft. x 16 ft. What would the perimeter measure on a drawing in which the scale is $\frac{3}{4}$″ = 1 foot?
6. The distance across United States is about 3000 miles. On a map drawn to the scale 1″ = 200 mi., how much would this distance measure?
7. On the drawing of a church building the scale was $\frac{3}{8}$″ = 1 foot. How high is a statue that measure 6″ on the plan?



SCALE: $\frac{1}{16}$″ = 1 foot

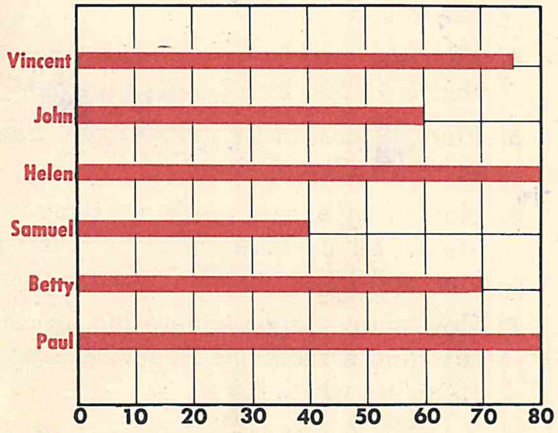
In the above garden find:

1. The actual length of the garden.
2. The actual width of the garden.
3. The dimensions of the flower patch.
4. The area of the tomato patch.
5. Which patch is the largest?
6. Find the area of the whole garden.
7. How many times the onion patch is the flower patch?
8. A plan for a vegetable garden is laid out on paper using a scale $\frac{1}{2}$″ = 1 ft. How far apart are the rows if they measure $1\frac{3}{8}$″ on the plan?
9. What are the actual dimensions of a tennis court, if the scale on the plan is $\frac{1}{4}$″ = 1 yd., the length on the plan is $2\frac{1}{2}$″, and the width, $1\frac{3}{4}$″?
10. How far apart are two cities shown on a map if they are 5 inches distant from each other and the scale is 1″ = 200 miles?
11. Find the dimensions on a plan of a room 15 ft. by 12 ft., if the scale is $\frac{1}{3}$″ = 1 ft.
12. What are the dimensions on a drawing of a playground if the scale is 1″ = 5 ft. The length of the playground is 75 ft., the width 60 ft.?

LESSON 6. Graphs

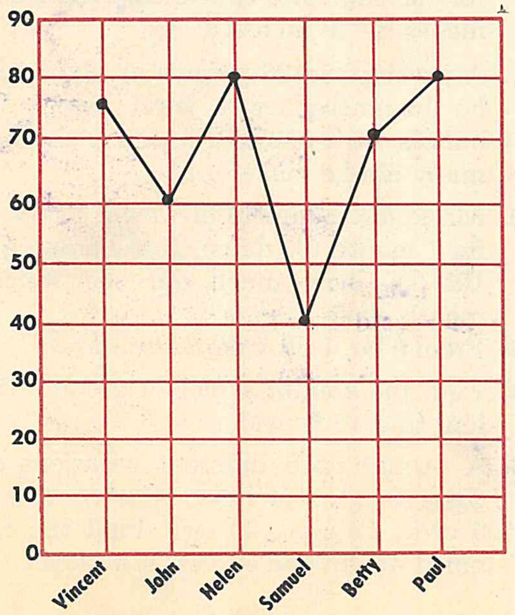
A graph is a picture which at a glance gives us information about numbers. It is an excellent way of presenting columns of numbers. Graphs are vivid and appealing, and that is why they are used so extensively in magazines and newspapers.

Below are examples of a bar graph and a line graph comparing the number of spelling words spelled correctly by different pupils over a certain period.



The above graph shows that out of 80 words Vincent spelled 75 correctly, John, 60, Helen, 80, Samuel, 40, Betty, 70, and Paul, 80.

What does the graph below show?



Draw simple bar graphs to illustrate the following data:

1. A small company made this budget for its expenses in 1951:
   Wages, \$30,000; taxes, \$5,000; operating expenses, \$1500; dividends, \$10,000.
2. The heights of five boys on a basketball team were 5′–9″, 5′–6″, 6′–3″, 5′–6″, 5′–9″. Scale—1 space = 3″. Begin at 5′.
3. In a circus parade there were 12 elephants, 10 lions, 8 tigers, 18 monkeys, and 4 bears.
4. The heights of five trees were 300 ft., 450 ft., 250 ft., 175 ft., 200 ft.
5. Six containers held 4 qt., 8 qt., 1 gal., 6 qt., 2 gal., 10 qt. Scale 1 space = 2 qt.
6. Five bullets weighed 8 oz., 12 oz., 1 lb. 4 oz., 14 oz., $1\frac{1}{2}$ lb. Scale—1 space = 4 oz.
7. On five successive days a car traveled 250 mi., 350 mi., 150 mi., 250 mi., and 225 mi.
8. Six boys cut grass on a certain day. They earned \$3.50, \$4.00, \$2.75, \$2.50, \$4.50, \$3.00.

Draw line graphs to illustrate the following data:

1. A girl's spelling marks on 5 successive school days were 75, 80, 85, 90, 75.
2. The profits of a certain firm for 5 successive years were: \$50,000, \$70,000, \$80,000, \$60,000, \$90,000.
3. A commission salesman earned on successive days \$140, \$50, \$80, \$60, and \$120.
4. An airplane traveled at the following numbers of miles per hour for 5 consecutive hours: 250, 300, 350, 300, 340.
5. A man's business doubled each day for 5 days. The first day's business was \$20. 1 space = \$40.
6. A boy's weight during 5 successive years are: 60, 65, 70, 80, 90.

UNIT 8 Test

Write the answers in your notebook:

Part I

Match Column B with Column A:

Column B	Column A
1. (?) $\frac{1}{4}$ acre h	(a) 8 mo.
2. (?) $8\frac{2}{3}$ yd. e	(b) 20 min.
3. (?) .5 acre f	(c) area
4. (?) $\frac{1}{3}$ hr. b	(d) 10 lb.
5. (?) $\frac{2}{3}$ yr. a	(e) 8 yd. 2 ft.
6. (?) $1\frac{1}{2}$ min. i	(f) 80 sq. rd.
7. (?) $7\frac{3}{4}$ lb. j	(g) perimeter
8. (?) .005 T. d	(h) 40 sq. rd.
9. (?) 1×w c	(i) 90 sec.
10. (?) 2L+2W g	(j) 7 lb. 12 oz.

Part II

1. Three steaks weighed 1 lb. 6 oz., 1 lb. 12 oz., and 1 lb. What was the average weight of the steaks? 1 lb 6 oz

2. A stick measures 16 ft. 3 inches. If a piece 8 ft. 9 in. is cut off, how much is left? 7' 6"

3. A train leaves Washington, D.C., for Baltimore at 4:40 P.M. The distance is 40 miles. If the train travels at 60 miles an hour, how long did it take it to reach Baltimore? What time did the train reach Baltimore? 40 min 5:20 P.M

4. Add 8 ft. 9 in. to 10 ft. 6 inches. 19' 3"

5. Find the distance around a square flower bed that measures 9 ft. 4 in. on each side. 37' 4"

6. A barrel that will hold 18 gallons, now contains 4 gal. 2 qt. How much more can be put into this barrel? 13 gal. 2 qt

7. An automobile covered 9 miles in 10 min. 12 sec. How long did it take the automobile to go 1 mile? 1 min. 8 sec

8. From 9 ft. 3 in. take 4 ft. 9 in. 4' 6"

Part III

1. What is the perimeter of a frame $10\frac{1}{4}$ inches long and $8\frac{1}{4}$ inches wide? 37"

2. A milkman delivered 10 gallons 2 qt. of milk to a store. At 16 cents a quart how much did the storekeeper pay for the milk? $1.72

3. What is the total weight in short tons of a horse weighing 1800 lb., a wagon weighing 1200 lb., and a ton of coal that is in the wagon? 3 1/2 tons

4. Find the area in sq. yd. of a flower bed that is 15 feet by 12 feet. 20 sq yd

5. Find the cost of 24 pints of ice cream at $1.84 a gallon. $ 5.52

6. How many square yards are there in the area of an airplane runway if it is $\frac{1}{4}$ mile long and 10 rd. wide? 24,200 sq yd

7. How many 3-inch square blocks can be cut from a rectangle 24 inches long and 18 inches wide? 48

8. A string 6 feet long is cut into 4 equal pieces. How long is each piece? 1 1/2

9. Find the perimeter of a $10\frac{1}{4}$-in. square. 41"

10. Find the number of yards of lace needed for the edge of 3 covers that measure 10 inches by 20 inches. 5 yd.

11. A jeweler had 26 pounds of silver which he hammered into jewel cases. If 4 ounces were required for each case, how many did he make? 104

12. Marie lost 8 ounces of weight every day for 1 month (30 days). If she now weighs 105 lb., how much did she weigh a month ago? 120 lb.

13. From 6 bu. 1 pk. take 2 bu. 3 pk. 3 bu. 2 pk

14. Find the area of a plot of ground 35 ft. long and 40 ft. wide. 1,400 sq. ft

15. A farmer on 5 different occasions sold these weights of hay: 14 cwt., 25 cwt., 9 cwt., 12 cwt., 20 cwt. Find the combined weight and express it in tons. 4 tons

UNIT 9 ● ENRICHMENT MATERIAL

PART I: Work for Quick Thinkers

1. Finding Interest and Keeping a Budget

Interest is money paid for the use of money.

Mr. Davis borrows **$1600** from the bank in order to remodel his store. He agrees to pay to the bank **5%** interest.

The amount borrowed is called the *principal.*

The *interest* is reckoned on the principal.

The *interest* is the result obtained by multiplying the principal by the rate.

Interest = principal × rate

The interest for **2** years is twice the interest for **1** year. For **$2\frac{1}{2}$** years the interest will be **$2\frac{1}{2}$** times the interest for **1** year.

The formula for finding the interest for time more or less than a year is:

$$\text{I} = \text{p.} \times \text{r.} \times \text{t.}$$
$$\text{or I} = \text{prt}$$

If Mr. Davis pays the interest on **$1600** for $1\frac{1}{2}$ years, how much will he pay?

$$\text{I} = \text{p.} \times \text{r.} \times \text{t.}$$
$$? = \frac{\$1600}{1} \times \frac{5}{100} \times \frac{3}{2}$$
$$= \$120$$
$$\$120 = \$1600 \times .05 \times 1\tfrac{1}{2}$$

If Mr. Davis at the end of $1\frac{1}{2}$ years pays in full the money he borrowed, what amount will he pay?

$1600 = the principal
120 = the interest
$1720 = the amount paid to the bank

Find the interest and the amount:

1. $300 4% 2 yr.
2. $2400 4% $2\frac{1}{2}$ yr.
3. $1500 6% $1\frac{1}{2}$ yr.
4. $600 3% $2\frac{1}{3}$ yr.
5. $900 2% 3 yr.
6. $800 3% $1\frac{1}{4}$ yr.

When we know the amount of income we have and plan how to spend it, we are making a budget. To make a budget helps us to spend our money wisely. The amount to be set aside for each purpose depends upon the number in the family and the amount of income received.

Shelter includes rent, fuel, light, telephone, household equipment, etc. If the house is owned by the family, taxes on the property and money for its upkeep will take the place of rent. Miscellaneous covers recreational expenses, medical and dental care, etc.

1. A possible budget for a family with an income of $2500 a year is shown below. Give the amount to be expended on each item listed. The total should equal $2500.

Allowance for	Per Cent	Amount
Shelter	**25%**	?
Food	**30%**	?
Clothing	**15%**	?
Contributions	**6%**	?
Miscellaneous	**15%**	?
Savings	**9%**	?

2. A budget for a family with an income of $3500 a year may be—food 30%, shelter 25%, clothing 15%, contributions 6%, miscellaneous 14%, savings 10%. Find. the amount to be allowed for each item.

3. The Dunn family planned a monthly budget on a salary of $260 a month. The expenses were divided as follows: food 40%, clothing 10%, shelter 20%, contributions 8%, miscellaneous 10%, savings 12%. Find the amount allowed for each item.

B. T. Jones & Co.

Name……………………………………

Address……………………………………

City & State……………………………………

Date:……………

Quan.	Mdse.	Unit Price	Amount	
1	Pr. Shoes	(7.98)	$7	98
1	Knife	(1.50)	1	50
6	Handkerchiefs	(.25)	1	50
1	Sprayer	(.45)		45
			$11	43

William Carroll

Name……………………………………

Address……………………………………

City & State……………………………………

Date:……………

Quan.	Mdse.	Unit Price	Amount	
1	Gown	(7.98)	$7	98
2	Dresses	(8.95)	17	90
1	Pr. Slippers	(3.50)	3	50
6	Towels	(.75)	4	50
			$33	88

A sales slip is a record of what a customer buys.

LESSON 2.

Sales Slips

1. Suppose you are a clerk at the Benson Stationery Store. Make out a sales slip to show the following purchases by Gloria Bates on April 5. Make sure the total is correct.

6 pencils	@	2 for 5¢
1 bottle ink	@	15¢
3 copy books	@	10¢
1 pencil case	@	75¢
1 compass	@	25¢

2. Bob spent his birthday money at the County General Store. Make out a sales slip for the items he bought.

4 flashlight batteries	@	20¢
1 model airplane kit	@	$1.75
2 football games	@	.75
2 boxes candy	@	.95
3 books	@	.85

3. Mr. Kinslow purchased equipment for an extensive camping trip at the Mountain Sport Shop on June 5. Make out a sales slip according to the following purchases:

3 fishing tackle	@	$8.50
1 light canoe	@	$98.00
2 flashlights	@	$1.50
4 blankets	@	$6.00
1 kettle	@	$3.98

4. Mrs. Campbell buys her groceries at the City Line Store. Make out a sales slip for the following purchases:

3 loaves of bread	@	15¢
2 cans of corn	@	30¢
2 boxes of strawberries	@	35¢
1 bunch carrots	@	20¢
12 cakes	@	6¢
2 doz. eggs	@	56¢
5 lb. of meat	@	75¢

LESSON 3

Operations in U. S. Money

1. Find the cost of 32 oranges at 48 cents a dozen. $1.28.

2. Find the total cost of the following articles:

2 lb. of coffee at $.68 per lb. 136
5 lb. of sugar at $.08 per lb. 40
$\frac{1}{4}$ lb. of butter at $.72 per lb. 18
$2\frac{1}{2}$ doz. eggs at $.64 per doz. 160
$3.54

3. Jane bought 3 yd. of silk at $.75 a yd., 3 spools of thread at 8 cents a spool, 12 yd. of lace at 7 cents a yd., and 3 cards of buttons at 12 cents each. How much change did she get from a $10 bill? $6.31

4. My electric bill for 3 months was $26.30. If I paid $8.50 in each of the first 2 months, how much must I still pay? 9.30

5. Mrs. Ahern paid $4.78 for electricity, $3.68 for gas, and $5.88 for telephone service. How much did she pay for all? $14.34

6. A gallon of gasoline costs 20.5 cents. There is a tax of 3.5 cents in addition. How much change will I receive if I buy 9 gallons and give the attendant a $5 bill? $2.84

7. An office is allowed $260 for various expenses. It spends $128.60 for files, $38.65 for books, and $83.50 for a typewriter. How much of the expense money is left? 9.25

8. A boy works in a store every afternoon after school from 4 p.m. to 6:30 p.m. If he is paid $.60 an hour, how much does he earn in 5 days? $7.50

9. A man bought a box of cakes for 32 cents. If there were 9 cakes in the box and he sold each cake for 5 cents, how much money did he make? 13¢

10. On a picnic there were 80 men and 100 women who paid 25 cents bus fare and 150 children who paid 15 cents bus fare. How much did they all pay? $67.50

11. To send a first class letter it costs 3 cents but a second class letter requires only 2 cents. What is the postage cost of 15 first class and 20 second class letters? $.85

12. In making an automobile trip, 35 gallons of gasoline were used. If the average price for the gasoline was $23\frac{1}{2}$ cents a gallon, how much did the gasoline cost? $8.22 1/2

13. A man bought some books at 73 cents each and sold them at $1.25. How much profit did he make on 50 books? $26.

14. A butcher bought 450 lb. of beef at a cost of $38.00 for 100 lb. How much did he pay for the beef? $171.

15. A dealer bought 16 suits for $384. Find the cost of 12 suits. $288.

16. If the English pound is worth $4.65, how many pounds could be obtained for $9300? 2000 lb.

17. A man starts on a job at an hourly rate of 90 cents and is paid time and half time for all time he works over the normal 40 hour week. If he works 60 hours during a week, what amount should he receive? $63.

18. A ream (480 sheets) of paper cost $3.60. What is the price of 36 sheets of paper at this rate? ($\frac{36}{480}$ × $3.60) $ .27

19. After drawing a check for $31.52, and another for $15.75, Mr. Brown's checkbook balance was $469.38. What was his balance before drawing the checks? $516.65

20. At 48 cents a pound find the cost of 2 chickens weighing $3\frac{1}{2}$ pounds and $4\frac{1}{4}$ pounds. $3.72

More Problems in U. S. Money

Solve:

1. A grocer buys a case of soap containing 120 pieces for $5.40. If he sells it at 6 cents a cake, how much profit does he make?

2. A man bought a crate of eggs (30 doz.) for $7.50. If he sold the eggs at 32¢ a dozen, how much profit did he make?

3. A lady bought 2 lb. of sugar at 6 cents a lb., $1\frac{1}{2}$ dozen of eggs at 32 cents a doz., and $2\frac{1}{2}$ lb. of meat at 96 cents a lb. How much change did she receive from a $5 bill?

4. A farmer had 1440 hens from each of which he received an egg every day. How much a day did he receive if he sold them at $.45 per dozen?

5. Dad bought John an overcoat for $19.75, a hat for $2.25, and a suit for $16.75. How much was the bill?

6. A can of vegetable soup costs 10 cents or 3 cans for 28 cents. How much can be saved on a dozen cans by buying them 3 at a time instead of singly?

7. A plumber received 1.62\frac{1}{2}$ an hour for a week of 42 hours. Find the amount of his pay.

8. During the course of a year a man bought for his children 5 pairs of shoes costing $5.00, $6.75, $8.25, $4.85, and $5.25. What was the average cost of one pair?

9. A tailor figured the cost of making a suit —$4\frac{1}{2}$ yards of serge at $1.20 a yd., cotton and trimmings for $8.75, and 16 hours of labor at $1.25 an hr. What was the cost of the suit?

10. What was Mrs. Craig's bread bill during January if she received 2 loaves each day (including Sunday), and an extra loaf on 4 different days, the price being 10 cents a loaf?

11. The floor space in three rooms measured 120.75 sq. ft., 136.75 sq. ft., and 224.5 sq. ft. How much would it cost to paint all three floors at $1.50 a square yard?

12. The receipts at a recent horse show were $759.50. If the total admission price was $1.75 per person, how many people attended?

13. A boy works at an hourly rate of 84 cents and is paid time and half-time for all time he works over the normal 40 hour week. If he works 55 hours during a week, what amount of money will he receive?

14. A plasterer worked from 7:45 A.M. to 3:30 P.M. with $\frac{1}{2}$ hour out for lunch. What did he earn if his hourly rate was $2.40?

15. Find the cost of 4 gallons of milk at $5\frac{3}{4}$ cents a pint.

16. Find the cost of 24 pints of ice cream at $1.80 per gallon.

17. At 30 cents a yard find the cost of hemstitching a table cloth 9 ft. long and 6 ft. wide.

18. Find the cost of $4\frac{1}{4}$ lb. of cheese at $.64 a pound.

What part of a dollar is:

19. 50¢, 25¢, 75¢, 20¢
20. 40¢, 60¢, 80¢, 90¢
21. 30¢, 10¢, 70¢, 15¢
22. 4¢, 2¢, 8¢, 6¢
23. $33\frac{1}{3}$¢, $66\frac{2}{3}$¢, $16\frac{2}{3}$¢, $8\frac{1}{3}$¢
24. $6\frac{2}{3}$¢, $6\frac{1}{4}$¢, $11\frac{1}{9}$¢, $14\frac{2}{7}$¢
25. $9\frac{1}{11}$¢, $12\frac{1}{2}$¢, $37\frac{1}{2}$¢, $62\frac{1}{2}$¢

Estimating answers helps us to avoid giving unreasonable answers to a problem.

What is **12×2.75**? We think:

2.75 is a little less than **3**.
$12 \times 3 = 36$. The answer to **12×2.75** should be a little less than **36**.

Is this estimation reasonable?

Estimating quotient figures in division helps us to avoid using trial figures in the quotient.

What is **$2132 \div 56$**?

We estimate that **3** must be the first quotient figure, because in our minds, we think:

4×56 is **224** and this is larger than **213**. Therefore a lower quotient figure is necessary.

LESSON 4. Estimating Answers

Give the answers orally.

1. $.6 \times 40$. Think .6 is a little more than the fraction (?), and (?) of 40 is (?). Therefore the answer is a little more than (?). Which answer is correct—24, 240, or 2.4?

2. 3.8×15. Think 3.8 is almost (?), and (?) × 15 is (?). Therefore the answer should be a little less than (?). Which answer is correct—570, 57, or 5.7?

3. $6 \div .2$. Think .2 is equal to $\frac{1}{5}$. When the divisor is less than 1, the quotient is (?) than the dividend. Therefore the answer is (?) than 6.
Which answer is correct—3, .3, or 30?

In the following which is the best estimate for the answer? (Do not use pencils). After estimating, check your estimate by working the examples in your notebook.

1. $12 \div .3 = 4$, .4, or 40?
2. $6 \div .03 = 20$, 200, or 2
3. $4.2 \times 25 = 10.5$, 1050, or 105
4. $1.45 \div 5 = 29$, 2.9, or .29
5. 130 minutes = about 2 hours or about $2\frac{1}{2}$ hours.

In the following which is the best estimate for the first quotient figure? (Do not use pencil)

1. $1665 \div 37 = 5$, 4, or 3
2. $3358 \div 46 = 8$, 7, or 6
3. $3648 \div 57 = 8$, 7, or 6
4. $972 \div 18 = 7$, 6, 5, or 4
5. $1152 \div 16 = 9$, 8, 7, or 6

In the following which is the best estimate for the answer? After estimating, check your estimate by working the problems.

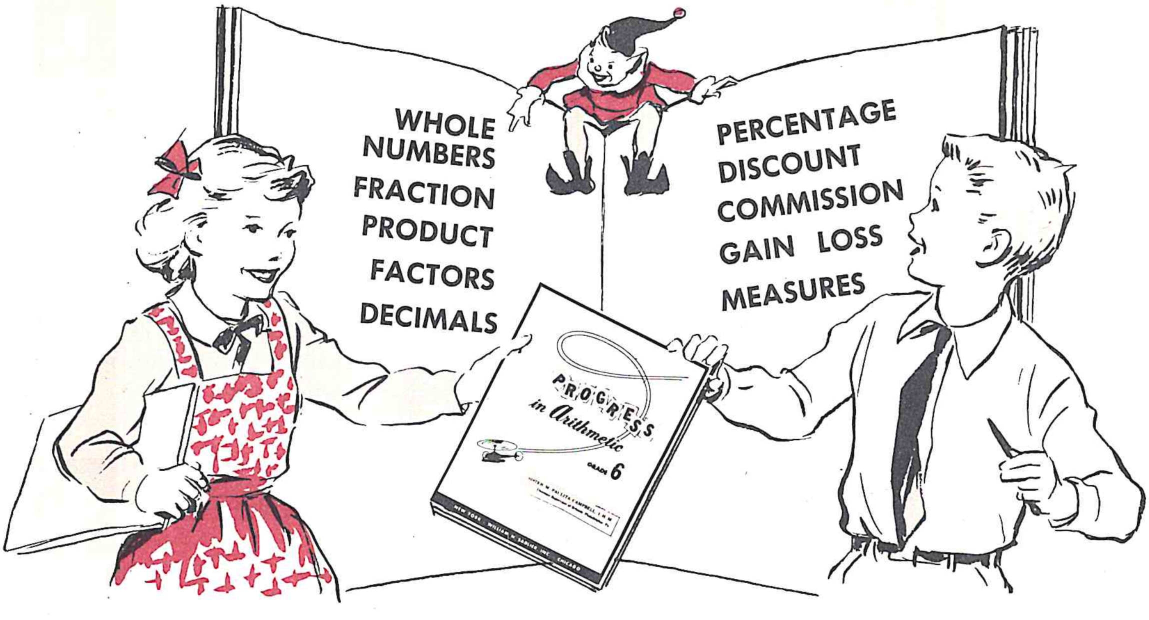
1. A coat marked \$60, is reduced 25%. What is the net price?
\$15, \$75, or \$45.

2. A house that cost \$4000, was sold at a gain of 25%. What was the selling price?
\$5000, \$1000, or \$3000

3. The net price of a bicycle is \$24. The original price is \$30. What is the rate of reduction? 25% or 20%

4. A salesman worked on a commission of 10%. If his sales amounted to \$5000, what were the proceeds? \$500 or \$4500

5. What is the area of a rug 15 ft. by 12 ft.? 20 sq. yd. or 180 sq. yd.



PART II: TESTS

TEST 1

1. (a) $34+307+20$ (b) $\frac{5}{8}-\frac{3}{8}$

2. (a) From 307 take 294 (b) Take 702 from 891

3. (a) $25\overline{)625}$ (b) $6\overline{)1242}$

4. (a) 509×34 (b) 635×40

5. (a) $\frac{3}{8}+\frac{1}{8}$ (b) $2\frac{4}{9}+7\frac{2}{9}$

6. A boy received the following marks on his report card: 85, 70, 97, 85, 72, 92, 87, 74, 80, 78. What was his general average?

7. John earned $4.80 and Joe earned $2.58. How much did they earn together?

8. John spent $3.78 of the $4.80 he earned. How much money remained?

9. Joe earned $2.58 each week for 4 weeks. How much money did he have?

10. At $.15 each how many magazines can John buy for $3.75?

TEST 2

1. (a) $301+570+674$ (b) $4\frac{2}{3}+3\frac{1}{3}$

2. (a) From 800 take 432 (b) Take 708 from 892

3. (a) $26\overline{)442}$ (b) $8\overline{)4880}$

4. (a) 708×56 (b) $5\frac{2}{3}+4\frac{1}{6}$

5. (a) $\frac{7}{8}-\frac{5}{8}$ (b) $3\frac{7}{8}-2\frac{1}{4}$

6. Tim planted $3\frac{1}{4}$ bushels of potatoes and Vincent planted $2\frac{7}{8}$ bushels. How many bushels did they plant together?

7. If Mary lives $\frac{7}{8}$ mi. from school and Joan lives $\frac{3}{4}$ mi., how much farther does Mary live than Joan?

8. James sold $3\frac{1}{4}$ gal. of ice cream on Monday and $2\frac{3}{16}$ gal. on Tuesday. How much did he sell on both days?

9. In 3 parochial schools there are 674 pupils, 385 pupils and 541 pupils. These schools have 22 rooms, 10 rooms, and 18 rooms. What is the average number of pupils in a room?

10. At $10.54 a suit, how much will it cost to buy baseball suits for 18 players?

TEST 3

1. (a) $403+5014+6$ (b) $4090-3907$

2. (a) From $1\frac{2}{3}$ take 1 (b) Take $6\frac{1}{2}$ from 8

3. (a) $36\overline{)864}$ (b) $45\overline{)4725}$

4. (a) $4\frac{5}{8}+5\frac{1}{16}$ (b) $9\frac{1}{2}+6\frac{3}{4}+8\frac{1}{8}$

5. (a) 3024×56 (b) 4031×37

6. One book cost $2.75, another $3.45. Find the cost of both.

7. A coat marked $19.75 is sold for $16. What is the reduction?

8. When a plane uses 38 gal. of gasoline in 1 hr., how much will it use in a 14 hr. trip?

9. It takes a plane 17 hr. to travel 1785 mi. How far does it travel in 1 hr.?

10. How much do 12,240 steel balls weigh if a gross of them weighs 216 lb.?

TEST 4

1. (a) $40+59+6+200$ (b) 345×76

2. (a) From 610 take 589 (b) Take 128 from 400

3. (a) $23{,}712\div78$ (b) $\$.09\overline{)\$8.37}$

4. (a) $6\frac{4}{7}-2\frac{1}{7}$ (b) $\frac{5}{8}-\frac{4}{9}$

5. (a) $1\frac{5}{9}+3\frac{2}{3}$ (b) $4\frac{1}{5}+6\frac{13}{15}$

6. John worked $5\frac{1}{2}$ hrs. on Monday and $3\frac{3}{4}$ hrs. on Tuesday. How many hrs. did he work on the two days?

7. If Mary used $3\frac{1}{3}$ yds., of ribbon from a bolt containing ten yds., how many yds. had she left?

8. A clock ticks 4 times a second. How many ticks does it make in 4 hrs?

9. A plane travels at the rate of 112 m.p.h. How long will it take to travel 2688 mi.?

10. Paul used 1.5 gal of gasoline in his motorbicycle on Monday, 2.4 gal. on Tuesday, and .6 gal. on Wednesday. How many gallons were used in all?

TEST 5

1. (a) $.8+.7+.5+3$ (b) $\$7.80+\$2.16+\$.24+\$.15$

2. (a) 4080×90 (b) $\$7.80\times43$

3. (a) $6\frac{9}{14}+1\frac{6}{7}$ (b) $13\frac{11}{12}+2\frac{5}{6}$

4. (a) $3\frac{5}{9}-1\frac{1}{18}$ (b) $6\frac{9}{14}-3\frac{1}{7}$

5. (a) $8643\div43$ (b) $20769\div69$

6. At $\$.09\frac{1}{2}$ a gal., what is the cost of 250 gal. of oil?

7. When 375 gal. of oil cost $26.25, what is the cost per gallon?

8. Mrs. Ward's electric bills for April, May and June amounted to $9.15. What was the average cost per month?

9. David has saved $5.00 toward a camera that costs $10.95. How much money does he still need?

10. Francis earned $3.75 one week, $4.20 the next week and $2.55 the following week. How much did he average weekly?

TEST 6

1. (a) $2.6+.3+16.7$ (b) $67+6+70+9$

2. (a) From $\frac{1}{3}$ take $\frac{5}{18}$ (b) Take $5\frac{5}{7}$ from $7\frac{13}{14}$

3. (a) 304×67 (b) 4050×60

4. (a) $1672\div19$ (b) $29{,}792\div49$

5. (a) $9\frac{11}{20}+4\frac{7}{10}$ (b) $1\frac{9}{10}+\frac{5}{12}$

6. A sport coat that was reduced $2.95 was sold for $10. What was the former price?

7. A lady purchased some cloth for $10.80. If the price was 40¢ a yd., how many yd. did she buy?

8. At $.84 a lb., find the cost of $5\frac{1}{2}$ lb. of butter.

9. After traveling in his car for a year Mr. Whalen's car registered 9,100 miles. How many miles did he average each week?

10. Ruth had a bolt of ribbon containing 15 yd. She used $7\frac{3}{4}$ yd. How many yards had she left?

TEST 7

1. (a) $234+23.4+2.34+.234$ (b) $.3+.04+.125+.2$

2. (a) $6.98-5.04$ (b) Take .07 from 9.07

3. (a) 1704×246 (b) 1800×207

4. (a) $56268\div521$ (b) $16920\div423$

5. (a) $4\frac{1}{9}-2\frac{1}{3}$ (b) $3\frac{5}{8}+2\frac{5}{6}$

6. John is 57 in. tall, James is 46.25 in. tall. How much taller than James is John?

7. A farmer planted 37.5 bu. of potatoes on Monday, 52.25 bu. on Tuesday, and 27.5 bu. on Wednesday. How many bushels were planted?

8. A plane averages 125.5 m.p.h. How far does it go in making a 15.25 hr. trip?

9. Joe earns $3.92 a week selling papers. In how many weeks will he earn $27.44?

10. At $110 an acre how much will $37\frac{1}{2}$ acres of land cost?

TEST 8

1. (a) $643+400+78+6$ (b) $3.78+.4+23+.143$

2. (a) $1430-1289$ (b) From 1.3 take .283

3. (a) 5620×509 (b) 1405×7.03

4. (a) $8295\div79$ (b) $428578\div842$

5. (a) $8\frac{5}{12}+4\frac{7}{8}$ (b) Take $17\frac{2}{3}$ from 20.

6. William can swim the width of the pool in 5.24 min., while it takes Robert 7.5 min. How much less time does it take William to swim the pool than Robert?

7. It takes $3\frac{1}{2}$ yd. of ribbon to make a bow for one cheer leader. How much ribbon will be needed for 10 bows?

8. Find the value of 34.6 plus 412.05 plus 11.06 plus 4.

9. What is 243.75 more than 741?

10. Mr. Smith pays $2744 for 7 acres of land. What is the cost per acre?

TEST 9

1. (a) $7\frac{3}{5}+4\frac{1}{2}$ (b) $3\frac{7}{10}+7\frac{3}{4}+1\frac{4}{5}$

2. (a) From 43 take .43 (b) Take $15\frac{2}{7}$ from $25\frac{1}{14}$

3. (a) $557.6\div680$ (b) $76188\div907$

4. (a) 2108×58 (b) $\$8.90\times70$

5. (a) $60716\div706$ (b) $.325+32.5+3.25$

6. If a soldier receives $52.50 a month, how much will he receive for $1\frac{1}{2}$ yrs. in the service?

7. When 9 books cost $27, how much will 15 cost?

8. Joan bought two books at $2.75 each. How much change will she receive from a $10 bill?

9. A pilot flew the following distances 87.5 mi., 125.25 mi., 227.2 mi. How many miles did he fly?

10. At $.54 a doz. how much will $7\frac{1}{2}$ doz. oranges cost?

TEST 10

1. (a) $7\frac{1}{7}+3\frac{1}{4}+5\frac{1}{2}$ (b) $.042+275+.34$

2. (a) From 37 take .0432 (b) Take $7\frac{5}{9}$ from $14\frac{1}{2}$

3. (a) $74.07\times.34$ (b) 6.2624×3.04

4. (a) $26.875\div43$ (b) $216648\div708$

5. (a) $3\frac{3}{8}\div1\frac{3}{4}$ (b) $2\frac{1}{2}\times1\frac{2}{5}$

6. When 9 yd. cost $24 what will 27 yd. of crepe cost?

7. Father Sefton bought 25yds. of red velvet for the shrine of Christ the King. At $3.72 a yd., what did he pay for the material?

8. How many $\frac{1}{2}$ lb. boxes can be filled from $7\frac{1}{2}$ lb. of nuts?

9. If 7 boys earn $9.94 among them, how much should each boy receive?

10. From the sum of $7\frac{1}{4}$ and $14\frac{1}{2}$ take $15\frac{3}{4}$.

TEST 11

1. (a) $23.6+74.07+64.1$ (b) $19\frac{5}{14}+36\frac{1}{7}$

2. (a) $\$3000-\$275.25$ (b) $4321-3998$

3. (a) $1.27484\div314$ (b) $13\frac{1}{2}\div4\frac{1}{2}$

4. (a) $5\frac{5}{8}\times3\frac{1}{9}$ (b) $.235\times.047$

5. (a) $304-271\frac{7}{12}$ (b) Find $\frac{8}{9}$ of 63

6. At $.25 a foot what must David pay for 75 yd. of copper wire?

7. Two packages of soap powder cost $.45. How much will a doz. packages cost?

8. Raymond earns $7.65 in one day. Donald earns $5.85. How much more than Donald does Raymond earn?

9. What is the perimeter of a football lot $225\frac{1}{2}$ yd. by $105\frac{3}{4}$ yd.?

10. How many $\frac{1}{4}$ lb. bags can be filled from $14\frac{3}{4}$ lb. of candy?

TEST 12

1. (a) $7896+6+742$ (b) $8.53+.388+6.4$
2. (a) $7050-6749$ (b) $3-.2892$
3. (a) $4.072\times.709$ (b) $156\div.52$
4. (a) $19-18\frac{15}{16}$ (b) $2\frac{2}{9}\div4\frac{1}{6}$
5. (a) $\frac{7}{8}\times\frac{3}{4}\times\frac{8}{15}$ (b) $1\frac{4}{5}+2\frac{3}{10}+\frac{5}{8}$
6. How many yds.of fencing will be needed to enclose a garden plot that is 25 ft. by 20 ft.?
7. Philip's mental averages were 95, 80, 75, 100, and 90. What was his weekly average?
8. Mr. Davidson's cabin plane flew 240 miles in $2\frac{1}{2}$ hr. How far did it go in 1 hr.?
9. The official length of the United States flag is 1.9 times its width. How long should a flag be if its width is 4.5 feet?
10. Daniel's bicycle wheel rotates 880 times in going 1 mile. How many rotations will it make in going $3\frac{1}{2}$ miles?

TEST 13

1. (a) $2.4+.889+.78$ (b) $9080-8979$
2. (a) .10207 minus .09 (b) $7\frac{3}{11}+14\frac{1}{3}+15\frac{1}{6}$
3. (a) 5309×68 (b) $.0387\times.998$
4. (a) $383736\div542$ (b) $210\div.42$
5. (a) $3\frac{1}{8}\times6\frac{2}{5}$ (b) $6\frac{3}{4}\div4\frac{2}{3}$
6. If a field is 178 ft. in length and 145 ft. in width, what is the perimeter in yards?
7. Tom's boat can travel a mile in 3.2 minutes. How long will it take to go 67.5 mi.? Give your answer in hours.
8. It takes a plane 3.5 hr. to travel 980 miles. What is its speed per hour?
9. In playing golf Edward makes the following scores 98, 104, 92. What is his average score?
10. Phyllis purchased 90 three-cent stamps. What change should she receive from a five-dollar bill?

TEST 14

1. (a) $.032+3.9+894$ (b) $\frac{13}{80}=$ (..?..) decimal
2. (a) From 13 take $11\frac{8}{9}$ (b) Take 47.89 from 5280
3. (a) 6070×908 (b) $1.509\times.009$
4. (a) $2496\div.78$ (b) $1\frac{3}{5}\div2\frac{1}{7}$
5. (a) $\dfrac{3}{\frac{6}{7}}$ (b) $\dfrac{\frac{5}{9}}{10}$
6. William's father used 5.8 gallons of gasoline in going 69.6 miles. How far did he go on 1 gallon of gasoline?
7. Our class bought 106 new books costing $.68 each. How much was spent on books?
8. The General Electric building is 209.8 ft. tall. The Bank Building is 304.7 ft. tall. What is the difference in their heights?
9. When milk costs $.26 a qt., how much will 9 pts.cost?
10. It takes $2\frac{1}{2}$ ft. of ribbon to make each of the 7 bows for the bouquets on Our Lady's shrine. How much will they cost when ribbon is $.25 a yard?

TEST 15

1. (a) $7.86+.205+1.08$ (b) 8490×860

2. (a) $1550\div .31$ (b) $128{,}674\div 182$

3. (a) Take 17 from 18.046 (b) From .059 take .004

4. (a) $.625\times .047$ (b) $8\frac{1}{10}\div 6\frac{3}{4}$

5. (a) $2\frac{5}{8}\times 4\frac{3}{7}$ (b) $\frac{8}{\frac{7}{12}}$

6. The average speed of Fulton's boat was 9.8 m.p.h. How far had it traveled in 5.5 hrs?

7. One fish weighed 38.25 lb. and another weighed 29.875 lb. What was the difference in their weights?

8. A salesman covered the following distances: 30.3 mi., 150.7 mi., 85.9 mi. How far did he travel?

9. Our class bought 6 dozen manuals for $36. What was the cost of each book?

10. Our school yard is 150 ft. long and 20 yd. wide. What is the perimeter in yards?

TEST 16

1. (a) $3786+59624+471$ (b) $4.72+.896+7.004$

2. (a) $3006-1987$ (b) $982-.982$

3. (a) $23.75\times .0204$ (b) $437\overline{)266133}$

4. (a) $24\frac{1}{7}+14\frac{1}{2}+12\frac{1}{6}$ (b) $37\frac{1}{6}-29\frac{1}{4}$

5. (a) $\frac{6}{\frac{2}{3}}$ (b) $\frac{\frac{3}{4}}{12}$

6. When $\frac{2}{3}$ ton of coal cost $13.50 what will 1 ton cost?

7. A certain jet plane has an average speed of 562 m.p.h. How far will it go in 6.75 hrs.?

8. Mary received the following marks in spelling 95, 92, 78, 87, 90. What was her average?

9. John's ordinary step covers 18 inches. How many steps does he take in walking 10 yards?

10. How many rods of fencing will be needed for a field 240 yd. long and 72 yds. wide?

TEST 17

1. (a) $.0076+7600+76.98$ (b) $7\frac{1}{3}+12\frac{4}{9}+6\frac{1}{12}$

2. (a) $\$9000-\$8999.57$ (b) $.46875\div 625$

3. (a) 7007×439 (b) $4.72\times .97$

4. (a) $2\frac{2}{11}\times 4\frac{7}{12}$ (b) $19\frac{5}{6}-14\frac{5}{9}$

5. (a) $\frac{64}{\frac{12}{13}}$ (b) $\frac{\frac{5}{6}}{10}$

6. A race track is 2.4 miles long. How many feet is this?

7. Mother has $\frac{5}{8}$ of a cake to divide among 10 children. What part of the cake will each child receive?

8. Mary has $\frac{3}{4}$ yd. of ribbon. She uses $\frac{1}{2}$ of it. How many inches are left?

9. When $2\frac{1}{2}$ lbs. of candy costs $1.50, what will 1 lb. cost?

10. Write in figures the number that represents half a million.

TEST 18

1. (a) $78+491+687+9$ (b) $.04+4.04+.792$

2. (a) From $7\frac{1}{10}$ take $4\frac{1}{20}$ (b) Take .298 from .3

3. (a) $6090-5908$ (b) $(\frac{3}{4}\div\frac{1}{2})+4$

4. (a) $7\frac{1}{2}+\frac{3}{4}+3\frac{1}{7}$ (b) $4\frac{5}{6}+7\frac{1}{15}+4\frac{4}{9}$

5. (a) $\dfrac{25}{2\frac{1}{2}}$ (b) $\dfrac{24\times14}{8}$

6. What is the area in sq. yd. of a field 75 yds. by 54.3 yds.?

7. A crate of 25 doz. oranges was bought for \$4.25 and sold at 29¢ a doz. How much profit was made?

8. At 10¢ a yard how much will it cost to hemstitch a scarf 7 ft. by 2 ft.?

9. A tank containing 1140.8 gallons can be emptied in 92 minutes. How many gallons is that a minute?

10. The width of our classroom is 25.5 ft., the length is 37.4 ft. What is the perimeter?

TEST 19

1. (a) $8\frac{1}{16}+13\frac{5}{8}+7\frac{3}{4}$ (b) $7\frac{1}{2}\times3\frac{1}{4}\times2\frac{1}{8}$

2. (a) $8060-7908$ (b) $46800\div7.5$

3. (a) $\frac{1}{8}=0.(\,?\,)$ (decimal) (b) $.83\frac{1}{3}=(\,?\,)$ (fraction)

4. (a) $(\frac{1}{2}$ of $16)+4$ (b) $354-19\frac{1}{5}$

5. (a) $\dfrac{24}{\frac{6}{13}}$ (b) $\dfrac{\frac{5}{6}}{10}$

6. Two-thirds of the distance from New York to Harrisburg is 178 mi. What is the distance?

7. How many girls can receive a $\$\frac{1}{4}$ each from \$37.50?

8. Express as decimals and find their sum: $\frac{7}{20}$, $\frac{3}{25}$, $5\frac{1}{8}$, $1\frac{7}{50}$.

9. What was the cost of 1 acre of land when 9.5 acres were purchased for \$2888?

10. What part of a mile does a boy run in a 220 yd. race?

TEST 20

1. (a) $27\frac{1}{8}+15\frac{13}{16}+10\frac{1}{2}$ (b) $8\frac{1}{3}\times\frac{2}{5}$

2. (a) $\frac{4}{7}=0.(\,?\,)$ (decimal) (b) $.37\frac{1}{2}=(\,?\,)$ (fraction)

3. (a) 32 bu. = (?) qt. (b) 29 sq. yd. = (?) sq. ft.

4. (a) $.625=(\,?\,)$ (fraction) (b) $.3075\div15$

5. (a) $\dfrac{\frac{2}{3}}{\frac{9}{8}}$ (b) $\dfrac{\frac{4}{7}}{\frac{1}{14}}$

6. Thomas now earns \$6.50 a week selling papers. This is $2\frac{1}{2}$ times as much as he earned when he started. How much did he earn when he started?

7. What is the area in sq. yds. of a 25 ft. square?

8. What is the difference in yards between .1 of a mile and .08 of a mile?

9. After spring football practice Donald weighed 171 lb. This was $\frac{9}{10}$ of his former weight. What was his former weight?

10. Find the cost of 2500 bricks at \$37.5 per hundred.

TEST 21

1. (a) $24\frac{1}{5}+35\frac{1}{10}+7\frac{3}{4}$ (b) $25\frac{2}{3}-24\frac{7}{10}$

2. (a) $8\frac{4}{9}\times 2\frac{4}{7}$ (b) $3\frac{1}{3}\div 4\frac{2}{3}$

3. (a) $\frac{7}{8}$ of (.?.) $=287$ (b) $\frac{1}{16}=$ (.?.) (decimal)

4. (a) 426.3×19.4 (b) $6.5415\div .147$

5. (a) $\dfrac{\frac{7}{9}}{\frac{14}{15}}$ (b) $\dfrac{\frac{8}{11}}{\frac{24}{25}}$

6. $\frac{7}{8}$ of the distance between two towns is 147 mi. What is the distance?

7. Vincent works 8 hrs. a day for 5 days. How much does he earn at the rate of \$.97 an hour?

8. A field is 20 rods in length and 45 rods in width. How many acres are there in the area of this field?

9. What is the difference between 1 mile and a thousand yards?

10. Pencils are bought for \$.72 a doz. and sold for 9¢ each. What is the gain on three dozens?

TEST 22

1. (a) $4.7+.98+72+.004$ (b) $1000+850+20{,}069$

2. (a) $.094\times 5.6$ (b) $64\div .016$

3. (a) $6\frac{5}{8}+17\frac{3}{10}$ (b) $9\frac{1}{6}\times 4\frac{4}{11}$

4. (a) $120-114\frac{5}{6}$ (b) 6500 lb. = (.?.) tons

5. (a) $\dfrac{\frac{9}{14}}{\frac{6}{7}}$ $\dfrac{\frac{3}{20}}{\frac{3}{4}}$

6. One team played 16 games and won 75% of them. How many games did they win?

7. When six lbs. of coffee cost \$4.68, how much will $3\frac{1}{2}$ lbs. cost?

8. How may times can you take 2 dozen out of three thousand?

9. What is the area in acres of a field 80 rod. by 250 rods?

10. An article listed at \$44 was sold at a discount of $9\frac{1}{11}$%. What was the selling price?

TEST 23

1. (a) $7.76+.682+.29$ (b) $6000-3.76$

2. (a) $9000\times .875$ (b) $.0296\div .032$

3. (a) (50% of 4) -1.5 (b) $25+$(25% of 8)

4. (a) $3\frac{3}{4}\times 8\frac{2}{3}$ (b) $185\times 2\frac{2}{5}$

5. (a) 5 tons = (.?.) cwt. (b) 380 sq. yds. = (.?.) sq. ft.

6. A man earns \$40 a week plus a 10% commission on all sales. If his sales during 1 week amounted to \$250, what did he receive that week?

7. If 52 is $3\frac{1}{4}$ times Jim's age, how old is he?

8. How many sq. yards are there in a 12 foot square?

9. Mr. Heenan bought an automobile for \$850 and sold it at a 25% gain. What was the selling price?

10. How many pounds of meat will be needed to serve 120 people allowing .5 lb. for each?

TEST 24

1. (a) $4.37+.57+.375$ (b) $5.03-3.176$

2. (a) 8.136×4.2 (b) $2898\div6.9$

3. (a) $116+18\frac{1}{3}+15\frac{3}{5}$ (b) $140-15\frac{4}{9}$

4. (a) $175\times25\frac{4}{5}$ (b) $160\div3\frac{1}{5}$

5. (a) (?) sq.rds. = 12 acres (b) $\frac{2}{3}$ of 2106

6. Mr. Simmons bought an automobile blanket for $5.75 and sold it at a gain of 20%. What was the gain?

7. An article is marked $2.75 and sold for 12% off. What is the selling price?

8. A grocer bought a crate of eggs (30 doz.) for $9.60 and sold them at $.44 a doz. How much did he gain?

9. Jim multiplied 240 by 10 instead of 204 by 10. By how much was his answer incorrect?

10. How many yards of fencing are needed to go around a plot of ground 90 ft. by 75 ft.?

TEST 25

1. (a) $26.5+.497+84$ (b) $6.0364-5.94752$

2. (a) 6.06×3.7 (b) $273\div.0325$

3. (a) 20 oz. = (?)% of 5 lb. (b) 60 = (?)% of 80.

4. (a) $(9\frac{1}{11}\%$ of $44)-3\frac{3}{4}$ (b) 40 min. 5 sec. = (?) sec.

5. (a) $\dfrac{\frac{10}{3}}{6\frac{2}{3}}$ (b) $\dfrac{5\frac{3}{7}}{\frac{19}{21}}$

6. A bicycle bought for $25 was sold for $20. What was the rate of loss?

7. When a plane can cover 524 miles in $2\frac{1}{2}$ hrs., how far does it travel in $1\frac{1}{2}$ hours?

8. If $\frac{7}{8}$ of a ton of coal cost $20.16 what will 1 ton cost?

9. One ham weighs 7 lbs. 14 oz. and another 8 lbs. 12 oz. How much do both hams weigh?

10. A man sold an estate for $150,000. If he received $5000 commission, what rate of commission did he receive?

TEST 26

1. (a) $.497+14.8+63.66$ (b) $.9144-.825$

2. (a) 2.061×2.04 (b) $16.968\div.84$

3. (a) $16\frac{1}{3}\div3\frac{1}{2}$ (b) $3\frac{1}{5}\div48$

4. (a) $62\frac{1}{2}\%$ of 144 (b) 250% of 1 lb. = (?) oz.

5. (a) $(37\frac{1}{2}\%$ of $24)\times20$ (b) $100-(12\frac{1}{2}\%$ of $96)$

6. Two cities are $7\frac{1}{2}$ in. apart on a map. 1 in. = 75 mi. How far apart are the two cities?

7. A team won 25 games and lost 5. What per cent of the games played were won?

8. $1.25 was deducted from a bill of $12.50. What rate of discount was given?

9. A man saved $27.50. This was $\frac{2}{7}$ of his monthly salary. What did he receive each month?

10. A girl weighed 97 lbs. and lost 10% of her weight. How much did she then weigh?

PART III: Problems for Real Thinkers

1. A truck tire weighs $62\frac{1}{2}$ lbs. The inner tube is .2 as heavy. Find the total weight of both.

2. Find the cost of 53.6 short tons of top soil at the rate of $1.50 per 1000 lbs.

3. A Piper Cub plane made a trip of 3200 miles in 24 hours flying time. What was its average speed per hour?

4. Mr. Daley bought 18 tons of coal for the winter. If he used 2.4 tons each month, how long did the coal last?

5. A new jet plane travels at the rate of 600 m.p.h. How long will it take to cross the continent, a distance of 3,000 mi.?

6. A cargo ship travels at the rate of 12 knots an hour. How many miles can it go in 6 hr. 30 min.? (1 knot = 1.5 mi.)

7. The distance across a river is 326.7 feet at its widest point. At its narrowest point it is 247.85 ft. How much does the river narrow down?

8. A jet fighter plane uses 59.8 gallons of fuel per hour. How much does it use in a $4\frac{3}{5}$ hour flight?

9. On a clear day the Statue of Liberty can be seen from a point 12 miles away, and on a cloudy day from a point only $1\frac{1}{2}$ miles away. How much farther can you see on a clear day?

10. The Washington monument is 585 feet high. If each step on the way up is 9 inches high, how many steps are there to a platform 27 feet below the peak?

11. Mr. Adams had $840. He spent $\frac{1}{3}$ of it for furniture, $\frac{1}{5}$ of it for entertainment, and $\frac{1}{4}$ of it for rent. How much money had he left?

12. There were 54 players on a baseball squad. After one week of practice, $\frac{1}{2}$ of them were dismissed. After the second week $\frac{1}{3}$ of the remainder were dismissed. How many of the players were left?

13. A dog was running across a field 480 yards wide. He covered $\frac{7}{10}$ of the distance when he fell into a pit. How far from the other edge of the field was the pit?

14. An automobile went $62\frac{1}{2}$ miles on Monday, twice as far on Tuesday, and three times as far on Wednesday as it had gone on Tuesday. How many miles did it travel in the three days?

15. Mr. Williams had $750 in a savings account. He withdrew $240 and spent $\frac{3}{4}$ of this amount. To what he had left of his withdrawals he added $25 and put the sum into the bank again. How much had he then in the bank?

16. Jane received $1\frac{1}{2}$ cents each for folding paper boxes. During five days she folded 150, 120, 170, 200, and 180 boxes. How much money did she earn?

17. Fourteen men worked on a laboring job. If they worked 8 hours a day for $5\frac{1}{2}$ days at $.75 an hour, what was the amount of the payroll?

18. At one time a sled went down a hill 150 feet high, then skimmed across the field 100 feet. The next time it upset in the field 25 feet from the bottom of the hill. What fraction of the first total distance had it covered the second time?

Solve:

1. On a state map 1 inch represents 50 miles. What is the distance between two cities if the scaled distance is $2\frac{3}{4}$ inches?

2. Find the perimeter of a room in yards if its width is $10\frac{1}{2}$ ft. and its length is $7\frac{1}{2}$ ft.

3. How many quarts of paint are needed to paint a floor 24 ft. long and 17 ft. wide if 1 quart of paint is used for every 34 sq. yrs.?

4. On a scale drawing of a machine one piece measures $1\frac{1}{2}$ inches. If the scale is $\frac{3}{8}$ inch represents 1 foot, how long is the piece?

5. How much fertilizer will James need for a garden 120 feet long and 80 feet wide if 1 pound of fertilizer is sufficient for 15 sq. yd.?

6. A field is 66 ft. long and 22 feet wide. What is its perimeter in rods?

7. Find the cost of laying a concrete walk 90 feet long and 6 feet wide at $2.25 a square yard.

8. What will Mr. Cooke pay for a field 40 rd. long and 75 rds. wide at $160 an acre?

9. A boy's savings account grew in 5 consecutive weeks: $8.00, $9.00, $10.50, $11.00, $13.00. Show this on a graph.

10. The number of eggs laid by 10 hens on 6 straight days were: 8, 10, 12, 9, 10, 11. Show this on a graph.

11. In 6 baskets there were the following numbers of peaches: 80, 84, 90, 76, 88. Show this on a graph. Hint: start at 76 and let each space =2 baskets.

12. How long will it take a car traveling 32.5 miles per hour to go 260 miles?

13. On a certain toboggan slide the sleds went down one hill 650 ft. long, and up another hill 270 ft. long. On one trip down, a sled upset 340 feet from the starting point. How far was it from the finishing point?

14. In traveling 6 successive miles an automobile made the following speeds in miles per hour: 56.7, 57.8, 58.6, 59.4, 60.2, 61.3. Find the average speed.

15. In the month of April 5 days had a rainfall of .5 inches, 6 had a rainfall of .4 inches, 4 others had a total rainfall of 2 inches, and the remaining days were clear. Find the average daily rainfall for the month.

16. In a recent test it was found that 300 lbs. of potatoes contained 48.6 lbs. of starch. How much starch was yielded by each pound of potatoes?

17. From a piece of ribbon 16 yards long there were cut 4 pieces 2.4, 3.62, 7, and 1.74 yd. How much of the original piece was left?

18. Twenty-two and one-half inches is what part of a yard?

19. If $\frac{3}{8}$ of a yard of linen is needed for one sewing bag, how much is needed for 128 bags?

20. Charles had $\frac{3}{4}$ of a dollar. He went to a circus and spent $\frac{3}{5}$ of a dollar. How much money did he have left?

21. In a spelling examination of 60 words Mary spelled $\frac{11}{12}$ of the words correctly. How many words did she misspell?

22. A baseball team played 154 games and won $\frac{3}{7}$ of them. How many games did they lose?

23. An automobile went 40 miles per hour for $3\frac{3}{4}$ hours. How fast would it have to go to cover the same distance in 3 hours?

24. A board was 18 ft. long. A carpenter sawed off $\frac{1}{4}$ of it. How long was the board then?

1. In one room 5% of the 60 pupils were absent and in another room 10% of the 40 pupils were absent. How many pupils were present in the two rooms?

2. A man bought a new car for $1875 (list price). He was allowed $475 for his old car and then was given a 5% discount for cash. How much did the car finally cost him in actual cash?

3. A grocer bought these items from a wholesaler:

   25 lbs. of coffee @ $.48
   100 lbs. of sugar @ .06
   500 lbs. of flour @ $.04\frac{1}{2}$

   and was given 2% discount for cash. How much did he pay for the items?

4. A boy bought a bicycle for $17.00 and spent $7.00 for repairs. He then sold it for $20. What was his per cent of loss?

5. Out of 20 problems John solved 13 correctly. What per cent of the problems did he solve correctly?

6. Mrs. Terry bought a sewing machine for $76. She paid 25% in cash and the remainder of the bill at $3 a week. How many weeks did it take her to pay for it?

7. A lady bought a dress for $14. There was a 2% sales tax. How much did the dress actually cost?

8. 144 boys were on a picnic. $\frac{1}{8}$ of them entered a race. If 9 of them finished, what per cent of the boys who entered the race finished?

9. In a certain eighth grade class there were 64 pupils. 30 boys and 26 girls were admitted to high school. What per cent of the class was admitted to high school?

10. A furniture dealer sold goods costing $320 for $480. His overhead expenses were $40. What per cent of the total cost was his profit?

11. A merchant bought a gross of brushes for $57.60. At what price must he sell each brush to gain 25% on the cost?

12. A pupil did 27 problems. If 9 of these were wrong, what per cent of the problems were wrong?

13. In order to take advantage of a 2% discount, a man paid for the following items within 10 days:

    6 gal. of oil @ 25¢ per qt.
    250 gal. of gasoline @ 24¢ per gal.

    Find the amount he paid.

14. A dealer purchased 30 doz. eggs at 48¢ a dozen. If he received 5% discount for cash, what was the amount of his bill?

15. On a rainy day 16 men and 14 girls reported for work. What per cent of 35 employees failed to report?

16. A grocer sold tea at 72 cents a pound, thereby making a profit of 12 cents on the cost. What per cent of the cost was his profit?

17. Mr. Porter sold a house for $4200 after he had bought it for $5600. What per cent did he lose on the cost?

18. Soap is advertized at 10¢ a cake. How much will a dozen cakes cost if a 10% discount is given?

19. A broker sold 50 bushels of potatoes at $2 a bushel. He charged 15% commission. How much did he earn?

20. A broker sold 1800 crates of oranges for a dealer at $3 a crate. He received a commission of 15%. How much did he return to the dealer?

21. Tim was making $145 a month and he received a 25% increase. What was his new salary?

22. John had $14.40. He bought skates for $6.60, a cap for $2.50, and a scarf for $1.70. What per cent of his money had he left?

23. A real estate company sold a farm of 80 acres at $150 an acre. The commission was 4%. How much did the owner receive?

1. The width of a sidewalk is .4 of its length. If the length is 60 ft., what is the perimeter?

2. A blanket is 7 ft. long and 60 inches wide. How many yards of binding are required for its edges?

3. How many inches of tape are required to go around a pedestal top $1\frac{1}{2}$ ft. long and 9 in. wide?

4. A field is 330 ft. wide and 990 ft. long. Find its perimeter in rods.

5. How much would a metal edge around a storm window cost at $.25 a foot? The window is 3′6″ wide and 7 ft. high.

6. How many yards in the perimeter of a square plot of ground which measures 40.5 ft. on each side?

7. Which is longer and by how much (a) the perimeter of a rectangle 19″ long and 14″ wide (b) the perimeter of a square 16″ on a side?

8. A basketball floor is 90 ft. long and 50 ft. wide. Find its perimeter in yards.

9. The rectangular screen on a television set is 12″ long and 8.5″ high. Find the perimeter.

10. The aerial of a television set is made up of 8 pieces of slender pipe. Four of them are 3′6″ long and four are 2′8″ long. Find the length of pipe required to make the aerial.

11. How many feet of moulding are required to go completely around a room 16′6″ long and 12′2″ wide?

12. How much must I pay for 3 gallons, 3 qts. of milk at 20 cents a quart?

13. A man shoveled 4 long tons of coal in 8 hours. How many pounds of coal did he shovel in an hour?

14. Find the cost of 7 quarts of oil at 72¢ a gallon.

15. A garage attendant pays $4.50 for 5 gallons of oil. How much does he gain if he puts the oil into quart cans and sells them at 30 cents each?

16. Find the total length of three boards that measure 4 yards, 4 feet, and 2 feet 6 inches.

17. Three steaks weighed 1 pound 4 ounces, 15 ounces, and 1 pound. What was the average weight of the steaks?

18. How long is a bridge if an automobile running 6 miles an hour passes over the bridge in $\frac{1}{15}$ of an hour?

19. A line 1 ft. 8 in. long is what fractional part of a line 6 ft. 8 in. long?

20. If 2 lb. 8 oz. of meat cost $2.40, what was the cost per pound?

21. An athlete ran 3 miles in $13\frac{1}{2}$ minutes. What part of a mile did he run in 1 minute?

22. Mother needs 5 pieces of lace to trim a dress. If each piece is 18 inches long, how many yards of lace does mother have to buy?

23. A baker sold pound cake at 80 cents a pound. He sold 4 pieces weighing 1 lb. 2 oz., 2 lb. 4 oz., 1 lb. 8 oz., and 2 lb. 2 oz., respectively. What was the total weight in pounds and what was the total selling price?

24. If it takes $2\frac{1}{3}$ yd. of ribbon to make a bow, how many can be made from a piece 16 yd. 1 ft. long?

25. An automobile covered 18 miles in 40 minutes and 30 seconds. How long did it take to go 1 mile? ($40\frac{1}{2} \div 18$)

26. How many seconds are there in 4 hr. 3 min. 27 seconds?

1. The distance between two towns is 216 miles. If a car travels $44\frac{4}{9}\%$ of the distance plus 5 miles, how many miles does it still have to go to reach the second town?

2. A dealer bought a coat for $108 and sold it at a gain of $33\frac{1}{3}\%$. In addition to this the customer had to pay a 10% sales tax on the selling price of the coat. How much did the customer pay for the coat?

3. A lumber dealer had $150,000 worth of lumber in his yard. The damage done by a recent fire amounted to $33,000. What per cent of the entire value was not damaged?

4. A tobacco dealer received a shipment of cigars marked $3.20 a box less 20% discount. He sold the cigars for $3.20 a box. What was his per cent of profit?

5. A basketball team won 22 games and lost 3. What per cent of its games did the team win?

6. At the beginning of the baseball season a player weighed 190 lb. After training he had lost 15%. What was his weight then?

7. On the first day of school 85% of the pupils were present. If the total enrollment was 1120, how many were absent the first day?

8. A furniture dealer listed a bedroom set at $195 less 15% discount. If the bedroom set had cost him $150, what was his gain per cent?

9. A jeweler bought a clock for $31 and sold it at a gain of 20%. Then he deducted 2% discount for cash. How much did the customer pay for it?

10. What per cent profit is there on an article bought for $12.50 and sold for $17.50 if there is an overhead cost of $2.50?

11. A new telegraph operator received 40 words a minute. Five months later he was taking 70 words a minute. What was his per cent of improvement?

12. The cost of baby chicks is 2 for 15 cents. If a dealer sells them at the rate of 3 for 25 cents, what is his per cent of profit?

13. Before Christmas a pair of skates was marked $6.75. After Christmas the price was $5.40. What was the rate of reduction?

14. In an arithmetic test 12% of the pupils failed. Two-thirds of those who failed were boys. If there were 200 taking the test, how many boys failed?

15. Mr. James bought a house for $12,500 and sold it for $15,000. What per cent on the cost did he realize?

16. If the marked price of a dress is $18, and the sales price is $15, what is the rate of discount?

17. An agent received $58.80 commission on sales which totaled $980. What was his rate of commission?

18. Forty per cent of a 150 acre farm was flooded. How many acres were not flooded?

19. Mary weighs 110 lb. A month ago she weighed $104\frac{1}{2}$ lb. What per cent of her present weight did she gain?

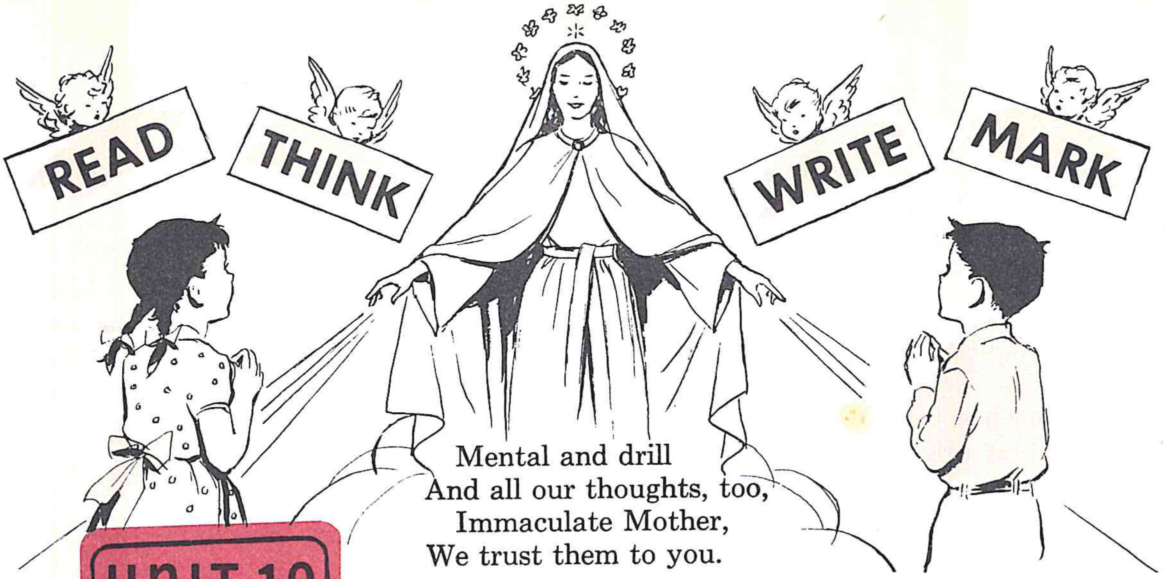
20. In a certain New England town there were 5000 French people in a total population of 250,000. What per cent of the people were French?

21. A street car fare was increased from 6 cents a ride to 2 rides for 15 cents. What was the per cent of increase?

22. The list price of a set of golf clubs was $42. If it was sold for $35, what was the per cent of reduction?

23. An auctioneer works for $30 a week plus 4% commission on all sales. In one week his total sales amounted to $345.25. How much did he make that week?

24. The list price on a set of books was $21. If the set sold for $19.32, what was the per cent of reduction?



Mental and drill
And all our thoughts, too,
Immaculate Mother,
We trust them to you.

UNIT 10 ● DRILL AND MENTAL

Drill 1

2 times 4, 8, 7, 9, 3, 10, 5, 11, 6, 12, 0

Change to improper fractions: $3\frac{1}{2}$, $1\frac{1}{2}$, $5\frac{1}{2}$, $6\frac{1}{2}$, $8\frac{1}{2}$, $4\frac{1}{2}$, $2\frac{1}{2}$, $7\frac{1}{2}$, $12\frac{1}{2}$, $9\frac{1}{2}$, $10\frac{1}{2}$, $11\frac{1}{2}$

$2\overline{)4 \quad 6 \quad 12 \quad 16 \quad 0 \quad 8 \quad 18 \quad 24 \quad 20 \quad 22}$

$2\overline{)5 \quad 9 \quad 13 \quad 17 \quad 21 \quad 19 \quad 25 \quad 11 \quad 15 \quad 23}$

Change to mixed numbers: $\frac{5}{2}$, $\frac{11}{2}$, $\frac{3}{2}$, $\frac{7}{2}$, $\frac{15}{2}$, $\frac{19}{2}$, $\frac{21}{2}$, $\frac{25}{2}$, $\frac{17}{2}$, $\frac{9}{2}$, $\frac{13}{2}$, $\frac{23}{2}$, $\frac{27}{2}$

$$\frac{1}{2}=\frac{\quad}{6}=\frac{\quad}{12}=\frac{\quad}{20}=\frac{\quad}{24}=\frac{\quad}{16}=\frac{\quad}{14}=\frac{\quad}{18}=\frac{\quad}{10}=\frac{\quad}{8}$$

Mental 1

1. At $2 a yard, how many yards of silk can be bought for $18?
2. At 36¢ for 6 copy books, find the cost of 2.
3. 2 times 7 is how much less than 2 times 8?
4. 2 times 5 is how much more than 2 times 0?
5. In the number 468, what does 6 mean?
6. What number divided by 2, will give 9 for the quotient, and 1 for the remainder?
7. Bob had $1.25 when he went to the circus. When he left the circus, he had $.15. How much had he spent?
8. Take 2 times 6 from 20.
9. Change $\frac{27}{2}$ to a mixed number.
10. How many feet are there in 2 yards?

Drill 2

3 times: 5, 7, 4, 9, 0, 10, 6, 8, 12

Change to improper fractions: $2\frac{1}{3}$, $5\frac{1}{3}$, $4\frac{2}{3}$, $6\frac{2}{3}$, $10\frac{2}{3}$, $9\frac{1}{3}$, $7\frac{2}{3}$, $3\frac{2}{3}$, $12\frac{1}{3}$, $1\frac{2}{3}$, $11\frac{1}{3}$, $8\frac{1}{3}$

$3\overline{)9 \quad 6 \quad 15 \quad 21 \quad 12 \quad 27 \quad 24 \quad 30 \quad 18}$

$3\overline{)7 \quad 17 \quad 22 \quad 29 \quad 10 \quad 14 \quad 26 \quad 19 \quad 28}$

Change to mixed numbers: $\frac{8}{3}$, $\frac{22}{3}$, $\frac{25}{3}$, $\frac{4}{3}$, $\frac{10}{3}$,

$$\frac{2}{3}=\frac{\quad}{9}=\frac{\quad}{27}=\frac{\quad}{24}=\frac{\quad}{18}=\frac{\quad}{12}=\frac{\quad}{15}=\frac{\quad}{21}=\frac{\quad}{6}=\frac{\quad}{30}$$

Mental 2

1. How much less than 3×9 is 3×7?
2. At 18¢ for a half dozen, find the cost of 3 pencils.
3. In the number 570, what does 0 mean?
4. How much more than 3×0, is 3×6?
5. How much more than $3+0$ is $3+4$?
6. What number divided by 3, will give 8 for a quotient, and 2 for a remainder?
7. Mary had $3.50. She spent $1.30. How much had she left?
8. How many 3¢ stamps can be bought for 29¢? How many cents are over?
9. How many feet are there in 7 yards?
10. Change $\frac{19}{3}$ to a mixed number.

Drill 3

Change to improper fractions: $2\frac{1}{2}$, $5\frac{1}{2}$, $3\frac{1}{2}$, $7\frac{1}{2}$, $6\frac{1}{2}$, $8\frac{1}{2}$, $4\frac{1}{2}$, $5\frac{1}{3}$, $7\frac{1}{3}$, $8\frac{1}{3}$, $9\frac{1}{3}$, $4\frac{2}{3}$, $3\frac{1}{3}$, $6\frac{2}{3}$, $8\frac{2}{3}$, $9\frac{2}{3}$, $2\frac{2}{3}$, $7\frac{2}{3}$, $1\frac{2}{3}$, $6\frac{1}{3}$

Change to mixed numbers: $\frac{19}{2}$, $\frac{7}{2}$, $\frac{15}{2}$, $\frac{17}{2}$, $\frac{9}{2}$, $\frac{13}{2}$, $\frac{11}{2}$, $\frac{5}{2}$, $\frac{10}{3}$, $\frac{20}{3}$, $\frac{26}{3}$, $\frac{8}{3}$, $\frac{28}{3}$, $\frac{5}{3}$, $\frac{19}{3}$, $\frac{14}{3}$, $\frac{29}{3}$, $\frac{7}{3}$, $\frac{25}{3}$, $\frac{22}{3}$, $\frac{17}{3}$, $\frac{4}{3}$

$$\frac{1}{2}=\frac{?}{8}=\frac{?}{12}=\frac{?}{24}=\frac{?}{16}=\frac{?}{14}=\frac{?}{20}=\frac{?}{18}=\frac{?}{10}$$

$$\frac{1}{3}=\frac{?}{27}=\frac{?}{9}=\frac{?}{21}=\frac{}{30}=\frac{}{12}=\frac{}{18}=\frac{}{15}=\frac{}{24}$$

Drill 4

4 times: 2, 8, 7, 6, 3, 9, 5, 10, 4, 0, 1

Change to improper fractions: $4\frac{1}{4}$, $5\frac{3}{4}$, $6\frac{1}{4}$, $8\frac{3}{4}$, $2\frac{3}{4}$, $9\frac{1}{4}$, $7\frac{3}{4}$, $10\frac{1}{4}$, $12\frac{1}{4}$, $11\frac{1}{4}$, $3\frac{3}{4}$, $5\frac{1}{4}$

$4\overline{)4 \quad 12 \quad 0 \quad 20 \quad 16 \quad 28 \quad 36 \quad 32 \quad 24 \quad 40}$

$4\overline{)7 \quad 9 \quad 21 \quad 17 \quad 13 \quad 22 \quad 5 \quad 10 \quad 18 \quad 19}$

Change to mixed numbers: $\frac{5}{4}$, $\frac{11}{4}$, $\frac{13}{4}$, $\frac{19}{4}$, $\frac{9}{4}$, $\frac{17}{4}$, $\frac{21}{4}$, $\frac{23}{4}$, $\frac{15}{4}$, $\frac{7}{4}$, $\frac{25}{4}$, $\frac{27}{4}$, $\frac{29}{4}$

$$\frac{1}{4}=\frac{}{12}=\frac{}{24}=\frac{}{36}=\frac{}{16}=\frac{}{20}=\frac{}{28}=\frac{}{32}=\frac{}{40}=\frac{}{8}=\frac{}{48}$$

Drill 5

4 times: 8, 6, 5, 7, 9, 12, 10, 3, 0, 11, 4

Change to improper fractions: $6\frac{1}{4}$, $8\frac{1}{4}$, $7\frac{3}{4}$, $5\frac{3}{4}$, $9\frac{3}{4}$, $4\frac{1}{4}$, $10\frac{1}{4}$, $3\frac{3}{4}$, $1\frac{3}{4}$, $2\frac{1}{4}$, $12\frac{1}{4}$, $11\frac{3}{4}$

$4\overline{)36 \quad 28 \quad 16 \quad 32 \quad 20 \quad 12 \quad 24 \quad 40 \quad 8}$

$4\overline{)25 \quad 29 \quad 33 \quad 37 \quad 41 \quad 26 \quad 30 \quad 34 \quad 38 \quad 39}$

$4\overline{)27 \quad 31 \quad 35 \quad 21 \quad 23 \quad 19 \quad 15 \quad 17 \quad 14}$

Change to mixed numbers: $\frac{27}{4}$, $\frac{29}{4}$, $\frac{33}{4}$, $\frac{37}{4}$, $\frac{39}{4}$, $\frac{23}{4}$, $\frac{26}{4}$, $\frac{31}{4}$, $\frac{25}{4}$, $\frac{15}{4}$, $\frac{21}{4}$, $\frac{19}{4}$, $\frac{13}{4}$, $\frac{11}{4}$

Mental 3

1. How much less than 3×0 is 2×0?
2. In the number 5,467, what does 5 mean?
3. At 3¢ each, find the cost of 30 stamps.
4. How many yards are there in 36 feet?
5. At a sale, the price of a rug was changed from \$32 to \$27. How much had it been reduced?
6. At 2 for 5¢, what will 6 apples cost?
7. At \$3 a yard, how many yards of material can be bought for \$30?
8. How much more than 1 yard is 41 inches?
9. Express $\frac{29}{3}$ as a mixed number.
10. Express $8\frac{1}{3}$ as an improper fraction.

Mental 4

1. How many hundreds are there in the number 30,820?
2. If 4 bars of soap cost 25¢, how much will 12 cost?
3. How many $\frac{1}{4}$'s are there in $7\frac{1}{4}$?
4. How much less than 4×0 is 3×0?
5. At 4¢ each, find the cost of 20 articles.
6. How many 4¢ rulers can be bought for 25 cents? What will be the remainder?
7. The price of eggs was 56¢ a dozen. A week later they were 63¢ a dozen. How much a dozen had they increased?
8. Find the sum of $\frac{3}{4}$ and $\frac{3}{4}$.
9. Express $\frac{29}{4}$ as a mixed number.
10. Write three thousand four in figures.

Mental 5

1. If 4 cup cakes cost 21¢, what will a dozen cost?
2. How much more than 3×0 is 4×0?
3. How much more than $3+0$ is $4+0$?
4. From the sum of $\frac{5}{7}+\frac{1}{7}$ take $\frac{2}{7}$.
5. A man paid \$8000 for a house, and sold it for \$9000. How much did he gain?
6. A man paid \$10,000 for a house and sold it at a loss of \$1000. For how much did he sell his home?
7. Express $9\frac{3}{4}$ as fourths.
8. Express $\frac{39}{4}$ as a mixed number.
9. $4\overline{)2432}$
10. Write seven thousand eight in figures.

Drill 6

5 times: 4, 9, 6, 10, 8, 12, 0, 5, 7, 3

Change to improper fractions: $3\frac{1}{5}$, $6\frac{1}{5}$, $9\frac{1}{5}$, $4\frac{2}{5}$, $10\frac{2}{5}$, $8\frac{4}{5}$, $5\frac{3}{5}$, $12\frac{1}{5}$, $7\frac{3}{5}$, $2\frac{4}{5}$, $1\frac{3}{5}$

$5\overline{)\,15 \quad 10 \quad 30 \quad 40 \quad 50 \quad 20 \quad 45 \quad 60 \quad 25 \quad 35}$

$5\overline{)\,7 \quad 9 \quad 11 \quad 13 \quad 16 \quad 17 \quad 21 \quad 23 \quad 24 \quad 26}$

Change to mixed numbers: $\frac{13}{5}$, $\frac{19}{5}$, $\frac{11}{5}$, $\frac{7}{5}$, $\frac{9}{5}$, $\frac{16}{5}$, $\frac{24}{5}$, $\frac{21}{5}$, $\frac{18}{5}$, $\frac{14}{5}$, $\frac{17}{5}$, $\frac{22}{5}$, $\frac{26}{5}$, $\frac{28}{5}$

$$\frac{1}{5}=\frac{?}{30}=\frac{?}{45}=\frac{?}{15}=\frac{?}{20}=\frac{?}{35}=\frac{?}{40}=\frac{?}{25}=\frac{?}{50}$$

Mental 6

1. What is left from 85¢ after spending 15¢ and 40¢?
2. What is the difference between 5 × 0 and 3 × 0?
3. What is the difference between 5 + 0 and 5 + 1?
4. Divide 1540 by 5, and take 8 from the quotient.
5. One factor of 45 is 5, what is the other factor?
6. A bookcase was sold at a sale for $28.50. If the previous price had been $30, how much had it been reduced?
7. At 5 cents each, what will 1 dozen balloons cost?
8. How much more than $3\frac{4}{5}$ is $\frac{21}{5}$?
9. Express $\frac{28}{5}$ as a mixed number.
10. Write nine thousand eight in figures.

Drill 7

5 times: 4, 6, 8, 9, 0, 3, 7, 5, 12, 11

Change to improper fractions: $4\frac{1}{5}$, $8\frac{1}{5}$, $7\frac{3}{5}$, $6\frac{2}{5}$, $9\frac{3}{5}$, $7\frac{4}{5}$, $3\frac{2}{5}$, $2\frac{2}{5}$, $5\frac{1}{5}$, $10\frac{3}{5}$, $12\frac{1}{5}$, $11\frac{3}{5}$

$5\overline{)\,10 \quad 15 \quad 30 \quad 45 \quad 20 \quad 35 \quad 25 \quad 60 \quad 40 \quad 50}$

$5\overline{)\,26 \quad 29 \quad 31 \quad 33 \quad 36 \quad 39 \quad 41 \quad 43 \quad 46 \quad 48}$

Change to mixed numbers: $\frac{27}{5}$, $\frac{31}{5}$, $\frac{37}{5}$, $\frac{26}{5}$, $\frac{32}{5}$, $\frac{41}{5}$, $\frac{43}{5}$, $\frac{47}{5}$, $\frac{49}{5}$, $\frac{28}{5}$, $\frac{34}{5}$, $\frac{38}{5}$, $\frac{29}{5}$

$$\frac{4}{5}=\frac{?}{20}=\frac{?}{45}=\frac{?}{30}=\frac{?}{60}=\frac{?}{35}=\frac{?}{40}=\frac{?}{25}=\frac{?}{50}$$

Mental 7

1. From the sum of $\frac{5}{8}$ and $\frac{2}{8}$ take $\frac{3}{8}$.
2. In the number 8.3 what does 3 mean?
3. If 5 bars of soap cost 18¢, what will 15 cost?
4. At a sale, Mary bought a dress for $18. It had been reduced $2. What had been the former price?
5. How much more than (5 × 0) is (6 × 0)?
6. From 6 + 0 take 4 + 1.
7. How much more than $\frac{43}{5}$ is $9\frac{1}{5}$?
8. One factor of 21 is $\frac{3}{5}$, find the other factor.
9. How many nickels and how many cents over are there in 47¢
10. Write eighteen thousand one in figures.

Drill 8

Multiply by 4 and then by 5: 3, 6, 8, 4, 7, 9, 10, 5, 11, 2, 12, 0

Change to improper fractions: $5\frac{1}{4}$, $6\frac{1}{4}$, $8\frac{3}{4}$, $9\frac{3}{4}$, $7\frac{3}{4}$, $4\frac{1}{4}$, $2\frac{1}{4}$, $3\frac{1}{4}$, $10\frac{3}{4}$, $5\frac{1}{5}$, $6\frac{3}{5}$, $7\frac{2}{5}$, $8\frac{4}{5}$, $2\frac{3}{5}$, $8\frac{3}{5}$, $9\frac{1}{5}$, $10\frac{2}{5}$, $4\frac{1}{5}$, $6\frac{1}{5}$, $3\frac{4}{5}$, $12\frac{4}{5}$, $10\frac{1}{5}$, $11\frac{2}{5}$

Mixed numbers: $\frac{46}{5}$, $\frac{41}{5}$, $\frac{51}{5}$, $\frac{61}{5}$, $\frac{21}{5}$, $\frac{43}{5}$, $\frac{49}{5}$, $\frac{33}{5}$, $\frac{14}{5}$, $\frac{18}{5}$, $\frac{27}{5}$, $\frac{38}{5}$, $\frac{23}{4}$, $\frac{9}{4}$, $\frac{27}{4}$, $\frac{33}{4}$, $\frac{41}{4}$, $\frac{51}{4}$, $\frac{13}{4}$

Mental 8

1. From the difference between $\frac{8}{9}$ and $\frac{1}{9}$ take $\frac{4}{9}$.
2. If 5 copy books cost 24¢, what will 20 cost?
3. John paid $42 for a bicycle and sold it for $40. How much did he lose?
4. Take $\frac{1}{5}$ of 60 and add 8.
5. 60 eggs equal ...(.?.)... dozen.
6. In the number 34.05, what does 5 mean?
7. To 5 + 1 add 6 + 0.
8. Divide 1020 by 5, and take 4 from the quotient.
9. How much less than $8\frac{2}{5}$ is $\frac{39}{5}$?
10. Write nineteen thousand six in figures.

Drill 9

6 times: 3, 8, 6, 9, 0, 7, 10, 5, 12, 4, 11

Improper fractions: $4\frac{1}{6}$, $2\frac{5}{6}$, $3\frac{1}{6}$, $6\frac{5}{6}$, $5\frac{1}{6}$, $8\frac{1}{6}$, $9\frac{1}{6}$, $10\frac{1}{6}$, $7\frac{1}{6}$, $1\frac{1}{6}$, $9\frac{5}{6}$, $12\frac{1}{6}$, $11\frac{5}{6}$

$6\overline{)\,12\quad 24\quad 36\quad 18\quad 30\quad 42\quad 54\quad 48\quad 60\quad 0}$

$6\overline{)\,14\quad 26\quad 31\quad 20\quad 9\quad 10\quad 15\quad 13\quad 19\quad 23}$

Mixed numbers: $\frac{11}{6}$, $\frac{17}{6}$, $\frac{25}{6}$, $\frac{7}{6}$, $\frac{13}{6}$, $\frac{41}{6}$, $\frac{19}{6}$, $\frac{23}{6}$, $\frac{43}{6}$, $\frac{29}{6}$, $\frac{47}{6}$, $\frac{31}{6}$, $\frac{35}{6}$, $\frac{37}{6}$

$$\frac{1}{6}=\frac{?}{18}=\frac{?}{24}=\frac{?}{12}=\frac{?}{36}=\frac{?}{54}=\frac{?}{30}=\frac{?}{42}=\frac{?}{48}=\frac{?}{60}$$

Mental 9

1. If 6 pencils cost 25¢, what will 18 cost?
2. From the sum of $\frac{5}{12}$ and $\frac{1}{12}$ take $\frac{1}{2}$.
3. From 6×1 take 6×0.
4. When an article costing $10 is sold at a loss of $2, for how much is it sold?
5. When an article costing $10 is sold at a gain of $2, for how much is it sold?
6. At 50¢ each, what will 6 books cost?
7. Share $1.20 among 6 boys. Each will receive ....(?)......
8. Divide 1230 by 6, and add 4 to the quotient.
9. How much more than $\frac{13}{6}$ is $2\frac{5}{6}$?
10. Write eighteen thousand eighteen in figures.

Drill 10

6 times: 2, 5, 9, 0, 12, 6, 8, 4, 10, 11

$6\overline{)\,30\quad 18\quad 54\quad 42\quad 48\quad 12\quad 24\quad 0\quad 72\quad 60}$

$6\overline{)\,35\quad 37\quad 41\quad 47\quad 55\quad 49\quad 59\quad 53\quad 31}$

Mixed numbers: $\frac{35}{6}$, $\frac{41}{6}$, $\frac{37}{6}$, $\frac{55}{6}$, $\frac{47}{6}$, $\frac{49}{6}$, $\frac{59}{6}$, $\frac{31}{6}$, $\frac{53}{6}$, $\frac{29}{6}$, $\frac{25}{6}$, $\frac{61}{6}$

$$\frac{5}{6}=\frac{?}{36}=\frac{?}{48}=\frac{?}{18}=\frac{?}{54}=\frac{?}{24}=\frac{?}{30}=\frac{?}{42}=\frac{?}{60}$$

Add 3 to 9, 8, 7, 4, 3, 6, 0, 2, 5, 1

Take 3 from 10, 12, 15, 19, 11, 17, 16, 18, 13, 14

Mental 10

1. At $.90 an hour, how much will Tom earn in 6 hours?
2. In the number 18.24, how many tenths are there?
3. To 6×9 add $6+0$.
4. From 6×8 take 6×0.
5. At 60¢ each, what will 9 books cost?
6. What part of a dozen is 10?
7. At 54¢ a dozen, what will 10 eggs cost?
8. When an article that has been reduced $2 is sold for $8, what was the price before the reduction?
9. How much more than $\frac{55}{6}$ is $9\frac{5}{6}$?
10. Write twenty-five thousand twenty-five in figures.

Drill 11

7 times: 3, 6, 1, 9, 2, 0, 7, 5, 8, 4

Improper fractions: $6\frac{1}{7}$, $3\frac{2}{7}$, $2\frac{3}{7}$, $8\frac{1}{7}$, $1\frac{4}{7}$, $5\frac{2}{7}$, $9\frac{1}{7}$, $4\frac{5}{7}$, $7\frac{6}{7}$, $10\frac{1}{7}$, $8\frac{5}{6}$, $9\frac{5}{6}$, $7\frac{5}{6}$

$7\overline{)\,42\quad 28\quad 56\quad 35\quad 0\quad 63\quad 49\quad 21\quad 14\quad 7}$

$7\overline{)\,10\quad 15\quad 13\quad 22\quad 19\quad 12\quad 11\quad 20\quad 24\quad 29}$

$7\overline{)\,31\quad 33\quad 23\quad 36\quad 34\quad 32\quad 18\quad 25\quad 27}$

Mixed numbers: $\frac{13}{7}$, $\frac{15}{7}$, $\frac{19}{7}$, $\frac{22}{7}$, $\frac{24}{7}$, $\frac{26}{7}$, $\frac{18}{7}$, $\frac{27}{7}$, $\frac{29}{7}$, $\frac{31}{7}$, $\frac{25}{7}$, $\frac{34}{7}$, $\frac{32}{7}$, $\frac{36}{7}$

Mental 11

1. Find the cost of 7 ties at 60¢ each.
2. How many inches are there in 7 feet?
3. To 7 times 0 add 8 plus 0.
4. What part of a week is 2 days?
5. $7\overline{)1428}$ minus 4.
6. $3\frac{4}{7}+2\frac{3}{7}$.
7. From 1 take $\frac{4}{9}$.
8. How much less than $4\frac{1}{7}$ is $\frac{26}{7}$?
9. Find $\frac{1}{7}$ of 630.
10. Write thirty-four thousand twenty-one in figures.

Drill 12

7 times: 5, 8, 6, 10, 0, 12, 9, 11, 4, 2, 3, 7

Improper fractions: $2\frac{1}{7}$, $1\frac{3}{7}$, $3\frac{1}{7}$, $3\frac{2}{7}$, $4\frac{1}{7}$, $5\frac{1}{7}$, $3\frac{2}{7}$, $3\frac{4}{7}$, $2\frac{3}{7}$, $1\frac{1}{7}$, $1\frac{5}{7}$, $4\frac{3}{7}$

$7\overline{)21\quad 28\quad 14\quad 42\quad 0\quad 7\quad 35\quad 49\quad 63\quad 56}$

$7\overline{)9\quad 12\quad 15\quad 11\quad 16\quad 13\quad 17\quad 22\quad 19\quad 24}$

$7\overline{)20\quad 30\quad 33\quad 31\quad 37\quad 25\quad 36\quad 34\quad 32\quad 23}$

Mixed numbers: $\frac{11}{7}$, $\frac{13}{7}$, $\frac{15}{7}$, $\frac{10}{7}$, $\frac{16}{7}$, $\frac{19}{7}$, $\frac{22}{7}$, $\frac{20}{7}$, $\frac{24}{7}$, $\frac{18}{7}$, $\frac{25}{7}$, $\frac{29}{7}$, $\frac{30}{7}$, $\frac{26}{7}$

Mental 12

1. John had 63¢. He spent $\frac{1}{7}$ of this amount; how much did he spend?
2. What is the selling price of an article bought for $18, and sold for $4 above the buying price?
3. What is the selling price of an article bought for $20, and sold for $3 less than the buying price?
4. From 7×8 take 7×0.
5. $7\overline{)3556}$ minus 8
6. If 7 feet of wire cost 35¢, what will 14 feet cost?
7. Which has the highest value .5, .506, .51?
8. $5+.4+.6$
9. $\frac{3}{4}=\frac{?}{100}$
10. Write six and seven hundredths.

Drill 13

7 times: 4, 7, 9, 3, 2, 6, 5, 0, 8, 10, 12

$7\overline{)36\quad 39\quad 41\quad 43\quad 45\quad 48\quad 50\quad 47}$

$7\overline{)46\quad 51\quad 53\quad 55\quad 52\quad 57\quad 60\quad 62\quad 64\quad 66}$

Mixed numbers: $\frac{36}{7}$, $\frac{39}{7}$, $\frac{41}{7}$, $\frac{43}{7}$, $\frac{45}{7}$, $\frac{48}{7}$, $\frac{47}{7}$, $\frac{40}{7}$, $\frac{50}{7}$, $\frac{51}{7}$, $\frac{55}{7}$, $\frac{57}{7}$, $\frac{60}{7}$, $\frac{62}{7}$, $\frac{64}{7}$, $\frac{58}{7}$, $\frac{53}{7}$, $\frac{61}{7}$, $\frac{65}{7}$, $\frac{68}{7}$, $\frac{69}{7}$, $\frac{52}{7}$, $\frac{59}{7}$, $\frac{67}{7}$, $\frac{66}{7}$

Add 4 to 9, 7, 8, 15, 11, 13, 0, 6, 14, 12

Take 4 from 11, 22, 27, 20, 14, 18, 13, 25, 16, 19

Mental 13

1. Mary practiced $\frac{1}{2}$ hr., 1 hr., $2\frac{1}{2}$ hr., $1\frac{1}{2}$ hr. How many hours did she practice in all?
2. In the number 8.014, what does 4 mean?
3. At 72¢ for 1 doz. oranges, 7 will cost ..(?)..
4. One factor of 84 is 7, what is the other factor?
5. John drove 280 miles in 7 hours. What was his average speed per hour?
6. At $60 a week, what will a man earn in 7 weeks?
7. From 1 take $\frac{4}{9}$.
8. To $3\frac{4}{7}$ add $2\frac{3}{7}$.
9. .75 = ..(?).. (fraction in lowest terms)
10. Write seven and seventy-two hundredths in figures.

Drill 14

8 times: 5, 7, 9, 3, 0, 8, 10, 6, 4, 12, 11

Improper fractions: $3\frac{1}{8}$, $5\frac{3}{8}$, $4\frac{5}{8}$, $7\frac{1}{8}$, $6\frac{1}{8}$, $9\frac{1}{8}$, $10\frac{3}{8}$, $7\frac{3}{8}$, $2\frac{5}{8}$, $8\frac{5}{8}$, $7\frac{5}{8}$, $8\frac{7}{8}$, $9\frac{7}{8}$

$8\overline{)16\quad 32\quad 48\quad 24\quad 40\quad 56\quad 72\quad 64\quad 80\quad 96}$

$8\overline{)9\quad 11\quad 13\quad 15\quad 17\quad 19\quad 21\quad 23\quad 25\quad 27}$

$8\overline{)30\quad 33\quad 31\quad 29\quad 22\quad 28\quad 34\quad 35\quad 37\quad 36}$

Mixed numbers: $\frac{9}{8}$, $\frac{11}{8}$, $\frac{17}{8}$, $\frac{19}{8}$, $\frac{13}{8}$, $\frac{21}{8}$, $\frac{23}{8}$, $\frac{25}{8}$, $\frac{27}{8}$, $\frac{15}{8}$, $\frac{29}{8}$, $\frac{31}{8}$, $\frac{33}{8}$, $\frac{35}{8}$, $\frac{39}{8}$

Mental 14

1. At 40 m.p.h., how long will it take to drive 320 miles?
2. At 25 m.p.h., how far will a ship go in 8 hours?
3. A boy had $5\frac{7}{8}$ yd. of string. He used $3\frac{3}{8}$ yd. He had remaining ..(?).. yd.
4. Add 3.4 and 1.6.
5. At $.90 a pound, what will 8 pounds of candy cost?
6. How much more than 8×1 is $8+1$?
7. $8\overline{)3216}$ minus 2
8. If one factor of 72 is 8, what is the other factor?
9. If the sum of two numbers is 13, and one of them is 4, what is the other?
10. Write eighteen and eighteen hundredths in figures.

Drill 15

8 times: 5, 7, 9, 3, 2, 0, 12, 10, 4, 6

$8\overline{)16\quad 72\quad 24\quad 48\quad 40\quad 64\quad 80\quad 56\quad 96\quad 88}$

$8\overline{)37\quad 39\quad 41\quad 43\quad 45\quad 47\quad 49\quad 51\quad 55}$

$8\overline{)57\quad 53\quad 59\quad 61\quad 65\quad 63\quad 67\quad 71\quad 73\quad 75}$

Mixed numbers: $\frac{41}{8}$, $\frac{45}{8}$, $\frac{43}{8}$, $\frac{47}{8}$, $\frac{49}{8}$, $\frac{51}{8}$, $\frac{57}{8}$, $\frac{55}{8}$, $\frac{59}{8}$, $\frac{61}{8}$, $\frac{65}{8}$, $\frac{63}{8}$, $\frac{67}{8}$, $\frac{69}{8}$, $\frac{71}{8}$

Add 5 to 6, 8, 14, 12, 9, 7, 13, 0, 11, 15

Take 5 from 19, 17, 11, 14, 12, 16, 18, 13, 15

Mental 15

1. How many inches in 8 feet?
2. Share $1.60 among 8 boys. Each receives ......(?)......
3. From 8×7 take 8×0.
4. From $8+7$ take $8+0$.
5. At 60¢ a yard, what will 8 yd. of muslin cost?
6. 105×8.
7. What is the difference in cents between 8 dimes and 8 nickels?
8. If $\frac{3}{8}$ of a class are girls, what fractional part are boys?
9. The original price of a coat was $25. It was reduced $5. It was sold for ......(?)......
10. Write one hundred four and eight tenths in figures.

Drill 16

Multiply by 8, then by 7: 6, 4, 3, 8, 0, 2, 5, 7, 10, 9

Change to improper fractions: $7\frac{1}{8}$, $5\frac{3}{8}$, $2\frac{7}{8}$, $8\frac{5}{8}$, $6\frac{7}{8}$, $9\frac{3}{8}$, $6\frac{5}{7}$, $8\frac{3}{7}$, $9\frac{4}{7}$, $4\frac{5}{7}$, $4\frac{6}{7}$, $3\frac{5}{8}$, $7\frac{3}{8}$

Mixed numbers: $\frac{31}{8}$, $\frac{35}{8}$, $\frac{39}{8}$, $\frac{41}{8}$, $\frac{43}{8}$, $\frac{45}{8}$, $\frac{47}{8}$, $\frac{49}{8}$, $\frac{51}{8}$, $\frac{53}{8}$, $\frac{55}{8}$, $\frac{57}{8}$, $\frac{59}{8}$, $\frac{63}{8}$, $\frac{65}{8}$, $\frac{67}{8}$, $\frac{36}{7}$, $\frac{43}{7}$, $\frac{48}{7}$,

$\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}-\frac{1}{2}$ $\frac{1}{2}\times\frac{1}{2}$ $\frac{1}{2}\div\frac{1}{2}$ $\frac{1}{3}\times\frac{1}{3}$

Mental 16

1. May takes steps $1\frac{1}{2}$ ft. long. How far will she go in 8 steps?
2. How much less than .2 is .16?
3. How many pounds will 8 letters weigh if each weighs 2 ounces?
4. How much will 7 cans of corn cost at 20¢ a can?
5. How much less than $\frac{1}{8}$ of 72 is $\frac{1}{9}$ of 72?
6. What part of 72 is 8?
7. From the sum of $\frac{1}{2}+\frac{1}{2}$ take $\frac{1}{3}$.
8. A lot that cost $540 was sold for $600. How much was gained?
9. Change $\frac{49}{8}$ to a mixed number, and subtract it from 7.
10. Write six hundred and forty-five hundredths in figures.

Drill 17

9 times: 3, 8, 7, 9, 0, 6, 2, 5, 10, 11, 12

Improper fractions: $3\frac{4}{9}$, $5\frac{2}{9}$, $8\frac{4}{9}$, $4\frac{5}{9}$, $2\frac{8}{9}$, $6\frac{7}{9}$, $2\frac{5}{9}$, $1\frac{7}{9}$, $10\frac{5}{9}$, $7\frac{4}{9}$, $9\frac{8}{9}$, $5\frac{5}{9}$, $7\frac{7}{9}$

$9\overline{)18\quad 36\quad 9\quad 0\quad 27\quad 81\quad 90\quad 72\quad 54\quad 63\quad 45}$

$9\overline{)10\quad 19\quad 28\quad 37\quad 11\quad 20\quad 29\quad 38\quad 22\quad 13}$

Mixed numbers: $\frac{10}{9}$, $\frac{14}{9}$, $\frac{19}{9}$, $\frac{11}{9}$, $\frac{20}{9}$, $\frac{13}{9}$, $\frac{16}{9}$, $\frac{22}{9}$, $\frac{17}{9}$, $\frac{35}{9}$, $\frac{37}{9}$, $\frac{41}{9}$, $\frac{23}{9}$, $\frac{29}{9}$, $\frac{31}{9}$, $\frac{25}{9}$, $\frac{26}{9}$

Mental 17

1. 50 cents contains 1 quarter, 1 nickel and ....?....... dimes.
2. Mrs. Landi bought 8 dozen oranges. If the family uses 8 oranges a day, how many days will they last?
3. How much is saved by buying a table reduced from $31 to $27?
4. How much more than $\frac{1}{9}$ of 63 is $\frac{1}{7}$ of 63?
5. How much less than $9\frac{1}{9}$ is $\frac{80}{9}$?
6. From $9+0$ take 9×0.
7. Jim weighs $87\frac{1}{2}$ lbs., Sam weighs $87\frac{7}{8}$ lbs. What is the difference in their weights?
8. At $1.05 a day, how much will Don earn in 9 days?
9. Find $\frac{1}{9}$ of 54, and subtract the result from 20.
10. Write three hundred two and seven thousandths.

Drill 18

9 times: 5, 8, 10, 7, 0, 4, 9, 6, 2, 3, 10

$9\overline{)40 \quad 43 \quad 44 \quad 46 \quad 48 \quad 49 \quad 50 \quad 52 \quad 53 \quad 55}$

$9\overline{)57 \quad 59 \quad 61 \quad 62 \quad 64 \quad 67 \quad 68 \quad 70 \quad 71 \quad 73}$

Mixed numbers: $\frac{40}{9}, \frac{44}{9}, \frac{41}{9}, \frac{47}{9}, \frac{46}{9}, \frac{49}{9}, \frac{43}{9}, \frac{58}{9}, \frac{59}{9}, \frac{61}{9}, \frac{64}{9}, \frac{62}{9}, \frac{65}{9}, \frac{55}{9}, \frac{53}{9}, \frac{50}{9}$

Add 6 to: 7, 9, 5, 8, 10, 13, 14, 12, 6

Take 6 from: 12, 20, 15, 11, 13, 19, 17, 18, 14, 16

$\frac{1}{3}+\frac{1}{3} \qquad \frac{1}{3}\div\frac{1}{3} \qquad \frac{1}{3}\times\frac{1}{3} \qquad \frac{1}{3}-\frac{1}{3} \qquad \frac{1}{3}+\frac{2}{3}$

Mental 18

1. Divide $\frac{1}{3}$ by $\frac{1}{3}$ and from the quotient take $\frac{1}{3}$.
2. What part of 12 is 9?
3. Find the cost of 9 oranges if 1 dozen cost 60¢.
4. The product of two numbers is 1809; one of them is 9, what is the other?
5. At a sale, rayon was reduced from $1.50 a yard to $1.35. How much a yd. was it reduced?
6. In 9 hours a plane covered 1800 miles. What was its average speed per hour?
7. The Scotts pay $136 a month rent for their home. How much a week is that?
8. Express $\frac{65}{9}$ as a mixed number.
9. Nine boys have contributed $4.50 for the missions. What is the average contribution?
10. Write—Eighty and forty-three thousandths in figures.

Drill 19

9 times: 7, 5, 0, 6, 2, 4, 9, 10, 8, 1, 3

$\frac{1}{9}=\frac{?}{18}=\frac{?}{36}=\frac{?}{45}=\frac{?}{72}=\frac{?}{81}=\frac{?}{96}=\frac{?}{27}=\frac{?}{9}$

Mixed numbers: $\frac{11}{9}, \frac{19}{9}, \frac{29}{9}, \frac{38}{9}, \frac{49}{9}, \frac{50}{9}, \frac{56}{9}, \frac{64}{9}, \frac{73}{9}, \frac{82}{9}, \frac{67}{9}, \frac{74}{9}, \frac{83}{9}, \frac{58}{9}, \frac{85}{9}, \frac{80}{9}$

$8\overline{)32 \quad 64 \quad 34 \quad 72 \quad 80 \quad 40 \quad 16 \quad 48 \quad 56}$

$\frac{1}{8}=\frac{?}{72}=\frac{?}{48}=\frac{?}{64}=\frac{?}{32}=\frac{?}{24}=\frac{?}{96}=\frac{?}{56}=\frac{?}{40}$

Add 7 to: 13, 9, 0, 7, 11, 8, 12, 5, 4, 6.

Take 7 from: 12, 18, 10, 15, 14, 11, 17, 13,

Mental 19

1. $(\frac{1}{3}+\frac{1}{3})+\frac{8}{9}$.
2. What part of 36 is 9?
3. If 3 doz. popsicles cost $1.80, what will 9 cost?
4. Helen cut a pie into 8 equal pieces. She ate two pieces, and gave two pieces to her brother. What fractional part of the pie was left?
5. How much less than $9+7$ is $9+0$?

From 6 to 10, give the number that completes the series:

6. 1, 2, 4, (?), 16, 32, 64.
7. 1, 3, 2, 4, 3, 5, 4, 6, (?).
8. 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{4}$, (?).
9. $\frac{1}{3}$, 1, $1\frac{2}{3}$, $2\frac{1}{3}$, 3, $3\frac{2}{3}$, $4\frac{1}{3}$, 5, $5\frac{2}{3}$, (?).
10. 3, 4, $3\frac{1}{2}$, $4\frac{1}{2}$, 4, 5, $4\frac{1}{2}$, $5\frac{1}{2}$, 5, (?).

Drill 20

Reduce: $\frac{2}{4}, \frac{4}{8}, \frac{8}{16}, \frac{4}{12}, \frac{8}{24}, \frac{4}{24}, \frac{4}{32}, \frac{8}{32}, \frac{16}{32}, \frac{12}{24}$

Find $\frac{1}{2}$ of: 8, 12, 16, 2, 14, 20, 4, 18, 6, 10, 22

$\frac{1}{4}+\frac{1}{4} \qquad \frac{1}{4}-\frac{1}{4} \qquad \frac{1}{4}\times\frac{1}{4} \qquad \frac{1}{4}\div\frac{1}{4} \qquad \frac{1}{2}-\frac{1}{4}$

Add 7 to: 4, 11, 6, 0, 12, 7, 13, 8, 5, 9

Take 7 from: 18, 11, 19, 13, 15, 12, 17, 14, 16

$.2+.1 \qquad .03+.01 \qquad .08+.01 \qquad .3+.7 \qquad .03+.07$

From 1 take: .3, .2, .1, .9, .7, .5, .6, .4, .8

Reduce: $\frac{2}{100}, \frac{20}{100}, \frac{5}{100}, \frac{4}{100}, \frac{10}{100}, \frac{30}{100}, \frac{40}{100}, \frac{80}{100}$

Mental 20

1. Reduce $\frac{12}{24}$ and add $1\frac{1}{4}$ to the result.
2. From 1 take .7.
3. Add .3 and .7.
4. $(\frac{1}{4}\div\frac{1}{4})-(6\times0)$.
5. Sarah paid $4.75 for a hat that had been reduced $1.25. What was the original price of the hat?

From 6 to 10 give the number that completes the series:

6. 21, 18, 19, 16, 17, 14, 15, 12, 13, (?).
7. $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4, 8, (?).
8. 1, 2, 4, 5, 7, 8, 10, 11, (?).
9. .2, .4, .6, .8, 1, 1.2, 1.4, (?).
10. 8, 7.5, 7, 6.5, 6, 5.5, 5, (?).

Drill 21

$\frac{1}{3}=\frac{?}{9}=\frac{?}{15}=\frac{?}{12}=\frac{?}{21}=\frac{?}{6}=\frac{?}{18}=\frac{?}{27}=\frac{?}{24}=\frac{?}{30}$

Find $\frac{1}{3}$ of: 12, 21, 27, 3, 15, 24, 30, 6, 18, 9

Reduce: $\frac{3}{6}$, $\frac{6}{12}$, $\frac{3}{18}$, $\frac{3}{24}$, $\frac{3}{30}$, $\frac{6}{30}$, $\frac{3}{9}$, $\frac{3}{12}$, $\frac{3}{27}$

Add 8 to: 4, 7, 11, 8, 3, 9, 5, 0, 6, 12

Take 8 from: 21, 16, 12, 9, 13, 18, 14, 15, 19

$\frac{1}{3}+\frac{2}{3}$ $\qquad$ $\frac{3}{4}+\frac{1}{4}$ $\qquad$ $\frac{4}{5}+\frac{1}{5}$ $\qquad$ $\frac{3}{4}-\frac{1}{4}$ $\qquad$ $\frac{3}{4}-\frac{1}{2}$

To 1 add: .4, .8, .03, .05, .25, .75, .15

From 1 take: .6, .2, .8, .7, .1, .9, .4, .5

Mental 21

1. In the number 6.047, what is the value of 4?
2. From the sum of 1 and .25 take .05.
3. From 1 take .1.
4. From $1\frac{3}{4}$ take $1\frac{1}{2}$.
5. What part of 270 is 30?

From 6 to 10, give the number that completes the series:

6. 3.5, 3, 4, 3.5, 4.5, 4, 5, 4.5, (?).
7. 3, 6, 4, 7, 5, 8, 6, 9, 7, 10 (?).
8. .2, .4, .8, 1.6, 3.2, 6.4, 12.8, 25.6, (?).
9. 32, 16, 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, (?).
10. 162, 54, 18, 6, 2, $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$, (?).

Drill 22

Find $\frac{1}{4}$ of: 8, 28, 4, 32, 12, 36, 40, 24, 48

$\frac{1}{4}=\frac{?}{12}=\frac{?}{24}=\frac{?}{32}=\frac{?}{16}=\frac{?}{40}=\frac{?}{36}=\frac{?}{20}=\frac{?}{8}=\frac{?}{28}=\frac{?}{48}$

Reduce: $\frac{4}{8}$, $\frac{4}{32}$, $\frac{4}{24}$, $\frac{4}{16}$, $\frac{4}{36}$, $\frac{4}{20}$, $\frac{4}{40}$, $\frac{4}{28}$, $\frac{12}{36}$, $\frac{16}{32}$

4)17 21 29 33 37 25 13 39 35 31

Change to mixed numbers: $\frac{9}{4}$, $\frac{23}{4}$, $\frac{17}{4}$, $\frac{31}{4}$, $\frac{35}{4}$

$\frac{4}{5}+\frac{1}{5}$ $\qquad$ $\frac{4}{5}+\frac{2}{5}$ $\qquad$ $\frac{3}{5}+\frac{3}{5}$ $\qquad$ $\frac{3}{5}\times\frac{3}{5}$ $\qquad$ $\frac{3}{5}\div\frac{3}{5}$

From 1 take: $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{3}{5}$, $\frac{5}{6}$, $\frac{3}{7}$, $\frac{2}{9}$, $\frac{7}{8}$

To 1 add: $\frac{3}{4}$, $\frac{1}{6}$, $\frac{3}{8}$, $\frac{7}{8}$, $\frac{1}{9}$, $\frac{2}{9}$, $1\frac{1}{9}$, $1\frac{2}{9}$

Mental 22

1. $(\frac{3}{5}\div\frac{3}{5})+.09$.
2. At 3 for 10¢ find the cost of 1 dozen.
3. In 4 hours a plane can go 832 miles. What is its average hourly speed?
4. A radio which cost $25 was sold for $22. What was the loss?
5. How many pieces $\frac{3}{4}$ ft. long can be cut from 6 ft.?

From 6 to 10 give the number that completes the series:

6. $\frac{1}{5}$, $\frac{3}{5}$, $\frac{2}{5}$, $\frac{4}{5}$, $\frac{3}{5}$, 1, $\frac{4}{5}$, $1\frac{1}{5}$, 1, $1\frac{2}{5}$, (?).
7. 2, 6, 4, 8, 6, 10, 8, 12, 10, 14, (?).
8. .1, .4, .7, .6, .9, 1.2, 1.1, 1.4, 1.7, 1.6, (?).
9. $\frac{1}{400}$, $\frac{1}{200}$, $\frac{1}{100}$, $\frac{1}{50}$, $\frac{1}{25}$, $\frac{2}{25}$, $\frac{4}{25}$, $\frac{8}{25}$, (?).
10. 1.5, 1.6, 1.8, 1.9, 2.1, 2.2, 2.4, (?).

Drill 23

Find $\frac{1}{5}$ of: 15, 30, 20, 45, 5, 35, 10, 50, 25, 40

$\frac{1}{5}=\frac{?}{20}=\frac{?}{45}=\frac{?}{40}=\frac{?}{15}=\frac{?}{25}=\frac{?}{10}=\frac{?}{35}=\frac{?}{50}=\frac{?}{30}$

Reduce: $\frac{5}{25}$, $\frac{5}{15}$, $\frac{5}{50}$, $\frac{5}{35}$, $\frac{5}{45}$, $\frac{5}{10}$, $\frac{5}{40}$, $\frac{20}{30}$, $\frac{40}{50}$, $\frac{5}{20}$

5)16 11 26 37 21 46 31 41 16 18 49

As mixed numbers: $\frac{36}{5}$, $\frac{33}{5}$, $\frac{43}{5}$, $\frac{21}{5}$, $\frac{44}{5}$, $\frac{34}{5}$

$\frac{3}{7}+\frac{4}{7}$ $\qquad$ $\frac{3}{7}+\frac{5}{7}$ $\qquad$ $\frac{4}{7}+\frac{5}{7}$ $\qquad$ $\frac{4}{7}\times\frac{4}{7}$ $\qquad$ $\frac{4}{7}\div\frac{4}{7}$

From 2 take: 1.9, 1.6, 1.4, 1.3, 1.2, 1.5, 1.7, 1.8

Add 2 to: .8, .4, 1.8, 1.4, .9, 1.9, .7, 1.7, .6, 1.6

Mental 23

1. From the sum of $\frac{5}{8}$ and $\frac{7}{8}$ take 1.
2. Express $\frac{625}{1000}$ as a decimal.
3. A hat marked $4 was reduced to $3. What was the reduction?
4. Bob had 50¢. He spent $\frac{1}{5}$ of it. How much had he left?
5. At $.60 a dozen, find the cost of 5 dozen.
6. At $.40 a $\frac{1}{2}$ lb., find the cost of $2\frac{1}{2}$ lb. of candy.
7. Find the sum of 1.8, 2, and .2.
8. Round 8,325 to the nearest thousand.
9. In the number 6,457.029, how many thousandths are there?
10. At 3 for 20¢, what will 15 bananas cost?

Drill 24

Find $\frac{1}{6}$ of: 18, 30, 42, 54, 60, 12, 36, 48, 24

$\frac{1}{6}=\frac{?}{36}=\frac{?}{54}=\frac{?}{24}=\frac{?}{12}=\frac{?}{30}=\frac{?}{42}=\frac{?}{18}=\frac{?}{48}=\frac{?}{60}$

Reduce: $\frac{6}{42}$, $\frac{6}{24}$, $\frac{6}{36}$, $\frac{6}{18}$, $\frac{6}{60}$, $\frac{6}{54}$, $\frac{6}{30}$, $\frac{6}{48}$, $\frac{6}{12}$

$6\overline{)37 \quad 55, \quad 31, \quad 65, \quad 35, \quad 49, \quad 41, \quad 25, \quad 23}$

Change to mixed numbers: $\frac{23}{5}$, $\frac{41}{5}$, $\frac{24}{5}$, $\frac{49}{5}$, $\frac{34}{5}$, $\frac{31}{5}$, $\frac{54}{5}$

$\frac{5}{9}+\frac{4}{9}$ $\quad \frac{5}{9}+\frac{5}{9}$ $\quad \frac{5}{9}-\frac{5}{9}$ $\quad \frac{5}{9}-\frac{2}{9}$ $\quad \frac{5}{9}\div\frac{5}{9}$

6 times: .2, .5, .7, .4, .8, .1, .0, .6, .3, .9

Add 3 to: .4, .9, .1, .5, .7, 0, .2, .6, .3, .8

Mental 24

1. Multiply .7 by 6, and take .2 from the product.
2. I bought a television set for $250, and sold it for $225. What was the loss?
3. Mildred bought a bag for $8.75. How much change should she receive from a ten dollar bill?
4. At 20¢ a $\frac{1}{4}$ lb., find the cost of $1\frac{1}{4}$ lbs. of candy.
5. Marie has $2\frac{1}{2}$ yds. of ribbon. Into how many $\frac{1}{2}$ yd. pieces can she cut it?
6. How much more than $\frac{33}{5}$ is $7\frac{1}{5}$?
7. Find the value of $\frac{3}{4}\times\frac{1}{3}\times 0$.
8. At 6 for 15¢, what will $1\frac{1}{2}$ dozen apples cost?
9. One factor of 6 is $\frac{3}{5}$. What is the other factor?
10. What part of 54 is 6?

Drill 25

$7\times.2$, .7, .9, .4, .8, .6, 0, .3, .5, .1

$4+.3$, .5, .4, .9, .1, .8, .6, 0, .2, .7

Take .1 from: 1.3, 1.9, 1.4, 1.8, 1.6, 1.5, 1.2, 1.7, 1.1

Improper fractions: $5\frac{2}{7}$, $9\frac{4}{7}$, $4\frac{1}{7}$, $3\frac{4}{7}$, $8\frac{3}{7}$, $6\frac{2}{7}$

Change to mixed numbers: $\frac{38}{7}$, $\frac{36}{7}$, $\frac{43}{7}$, $\frac{51}{7}$, $\frac{48}{7}$, $\frac{66}{7}$

From 3 take: $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{2}$, $\frac{1}{10}$

$\frac{3}{4}+\frac{1}{4}$ $\quad \frac{3}{5}+\frac{3}{5}$ $\quad \frac{3}{5}\times\frac{3}{5}$ $\quad \frac{3}{5}\div\frac{3}{5}$ $\quad \frac{3}{5}-\frac{3}{5}$

Multiply by 10: 4, .4, .04, .004, 5, .5, .05, .005

Mental 25

1. What change shall I receive from $1 after buying 7 yds. of ribbon at 10¢ a yard?
2. $7\overline{)714}$ and add 8 to the quotient.
3. Teresa had 30¢. She spent 10¢, and then earned 8¢. How much had she then?
4. Multiply .004 by 10.
5. $(\frac{3}{5}\div\frac{3}{5})+.9$.
6. How many inches are there in 3 yards?
7. From 3 take $\frac{7}{9}$.
8. Take .3 from 1.3.
9. How many hundredths are there in 42.35?
10. A plane covered 1400 miles in 7 hr. What was its average speed per hour?

Drill 26

8 times: .3, .5, .9, .0, .7, .1, .8, .2, .4, .6

Divide by 8: 32, 16, 64, 56, 72, 24, 40, 88, 48, 80, 96

Improper fractions: $6\frac{1}{8}$, $9\frac{3}{8}$, $4\frac{5}{8}$, $2\frac{7}{8}$, $7\frac{5}{8}$, $5\frac{7}{8}$, $3\frac{5}{8}$, $8\frac{1}{8}$

Mixed numbers: $\frac{51}{8}$, $\frac{73}{8}$, $\frac{67}{8}$, $\frac{61}{8}$, $\frac{47}{8}$, $\frac{35}{8}$, $\frac{29}{8}$, $\frac{75}{8}$, $\frac{59}{8}$, $\frac{71}{8}$

Add .3 to: .4, .3, .5, .6, .2, .1, .7, .8, .9, 0, 1

Take .3 from: .5, .8, .9, .7, .6, .4, 1.0, 1.2, 1.1, 1.3

From 4 take: $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{7}{8}$, $\frac{5}{6}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{8}$, $\frac{1}{6}$

$\frac{3}{8}+\frac{5}{8}$ $\quad \frac{1}{8}+\frac{7}{8}$ $\quad \frac{1}{6}+\frac{5}{6}$ $\quad \frac{5}{7}+\frac{2}{7}$ $\quad \frac{3}{7}+\frac{4}{7}$ $\quad \frac{1}{7}+\frac{6}{7}$

Multiply by 10: .3, .4, .5, .2, .8, .1, .6, .9, .7

Mental 26

1. Find 3.4 of 20.
2. What part of 20 is 5?
3. $18=\frac{3}{4}$ of what number?
4. Multiply .7 by 10.
5. When the average rainfall per month is 3.5 in., what will be the amount of rain to fall in 8 months?
6. Find the value of $8\times.9\times 0$.
7. When oranges are 5¢ each, how many can I buy for 60¢?
8. How many feet are there in 8 yards?
9. How many tens are there in 324.15?
10. Express .25 as a fraction in lowest terms.

Drill 27

9 times: .3, .5, .8, .1, 0, .9, .7, .4, .2, .6

Divide by 9: 2.7, 4.5, 1.8, 3.6, 6.3, 8.1, 7.2, 5.4, 9.0

Mixed numbers: $\frac{64}{9}$, $\frac{50}{9}$, $\frac{59}{9}$, $\frac{83}{9}$, $\frac{74}{9}$, $\frac{86}{9}$, $\frac{68}{9}$, $\frac{77}{9}$, $\frac{40}{9}$

Add .4 to: 1.3, 1.5, 1.2, 1.4, 1.9, 1.8, 1.6, 1.7, 1.0

Take .4 from: 1.9, 1.7, 1.8, 1.6, 2.3, 2.1, 2.0, 2.2, 2.4, 1.5

From $9\frac{1}{3}$ take: $2\frac{1}{3}$, $6\frac{1}{3}$, $5\frac{1}{3}$ $8\frac{1}{3}$, $9\frac{1}{3}$, $4\frac{1}{3}$, $7\frac{1}{3}$

Add $\frac{1}{7}$ to: $3\frac{1}{7}$, $2\frac{3}{7}$, $4\frac{5}{7}$, $6\frac{4}{7}$, $8\frac{6}{7}$, $9\frac{6}{7}$, $1\frac{6}{7}$, $\frac{6}{7}$

Multiply by 10: .04, .05, .08, .03, .02, .01, .09, .06, .07

Mental 27

1. $9\overline{)\$6.30}$
2. $10 \times .08$
3. From $9\frac{1}{3}$ take $7\frac{1}{3}$.
4. Multiply .01 by .6.
5. Which fraction has the greater value $\frac{3}{4}$ or $\frac{2}{3}$?
6. How much less than $\frac{59}{9}$ is $6\frac{1}{9}$?
7. Find the cost of $\frac{3}{5}$ yd. of lace at 75¢ a yard.
8. Express .05 as a fraction in its lowest terms.
9. How many tenths are there in 216.54?
10. Take .4 from 2.1.

Drill 28

9 times: .03, .04, .08, .09, .07, .05, 0, .06, .01, .02

Divide by 9: .27, .45, .36, .81, .72, .54, .18, .63

Add .5 to: .3, .5, .7, .9, .4, .6, .8, .2

Take .5 from: 1.1, 1.4, 1.0, 1.3, 1.2, 1.8, 1.9, 1.7

From 5 take: $4\frac{1}{5}$, $4\frac{3}{5}$, $4\frac{2}{5}$, $4\frac{4}{5}$, $3\frac{2}{5}$, $3\frac{1}{5}$, $3\frac{4}{5}$

Add $\frac{5}{7}$ to: $\frac{1}{7}$, $\frac{3}{7}$, $\frac{5}{7}$, $\frac{6}{7}$, $\frac{4}{7}$, $\frac{2}{7}$, $1\frac{2}{7}$, $1\frac{1}{7}$

Multiply by 10: 1.2, 1.3, 1.4, 1.8, 1.7, 1.6, 1.9, 1.5, 1.07, 1.1, 1.02, 1.03, 1.08, 1.05, 1.09, 1.04

Mental 28

1. Multiply .07 by 9.
2. Multiply 1.03 by 10.
3. Find $\frac{4}{5}$ of 25.
4. What part of 30 is 6?
5. 15 is $\frac{3}{5}$ of what number?
6. $9\overline{).36}$
7. From 5 take $3\frac{4}{5}$.
8. How much candy will be needed to fill 9 boxes if each box holds $\frac{2}{3}$ of a pound?
9. Jane studies 1.5 hours every day. How many hours does she study in 9 days?
10. How many hundreds are there in 614.09?

Drill 29

2 times: .3, .4, .1, .04, .05, .08, .09, .07, .06

Divide by 2: .04, .06, .08, .02, 1.04, 1.02, 1.08, 1.06

Give the dividend the same number of decimal places as the divisor:

$.2\overline{)4}$ $.4\overline{)8}$ $.6\overline{)7}$ $.3\overline{)9}$ $.9\overline{)5}$ $.5\overline{)6}$ $.8\overline{)2}$

$.2-.1$, $.3-.2$, $.4-.1$, $.5-.1$, $.6-.1$, $.4-.2$

Multiply by 100: .25, .35, .42, .64, .85, .92, .15, .51, .12, .43, .95, .28, .19, .36, .61, .34

From 2 take: $\frac{4}{7}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{1}{3}$, $\frac{3}{4}$, $\frac{5}{9}$, $\frac{1}{6}$, $\frac{3}{5}$, $\frac{7}{9}$

Mental 29

1. How much more than $9\overline{).27}$ is $2\overline{).08}$?
2. Multiply .35 by 100.
3. From 2 take $\frac{7}{8}$.
4. Add .6 to $\frac{1}{2}$ of itself.
5. Find $\frac{2}{3}$ of 12.
6. What part of 16 is 4?
7. $6 = \frac{2}{3}$ of what number?
8. What fraction added to $\frac{3}{4}$ will equal 1?
9. One factor of 8 is $\frac{4}{5}$. What is the other factor?
10. Write three and five thousandths in figures.

Drill 30

3 times: .04, .05, .01, .03, .02, .06, 07, .09, .08.

Divide by 3: .012, .006, .015, .018, .027, .021

Give the dividend the same number of decimal places as the divisor:

$.03\overline{)6}$ $.08\overline{)1}$ $.04\overline{)5}$ $.07\overline{)4}$ $.05\overline{)8}$ $.02\overline{)7}$ $.6\overline{)3}$
$.06\overline{)3}$ $.8\overline{)3}$ $.08\overline{)3}$ $.4\overline{)3}$ $.04\overline{)3}$

Multiply by 10 then by 100: .25, .35, .46, .57, .84, .96, .09, .04, .03, .02, .05, .06, .08

From 3 take: $2\frac{7}{8}$, $2\frac{4}{5}$, $2\frac{1}{6}$, $2\frac{3}{4}$, $2\frac{5}{7}$, $2\frac{5}{6}$, $2\frac{3}{7}$, $2\frac{5}{8}$

Mental 30

Supply the answers:

In division of decimals

1. The decimal point in the ....(?).... must be directly over the decimal point in the dividend.
2. The number of decimal places in the dividend must not be fewer than the number of decimal places in the ....(?)....
3. When the divisor contains tenths, multiply it by ....(?).... to make it a whole number.
4. When the divisor contains hundredths, multiply it by ....(?).... to make it a whole number.
5. If we multiply the divisor by 10, we must also multiply the ....(?).... by 10.
6. Find $\frac{3}{8}$ of 24.
7. What fractional part of 80 is 20?
8. $10 = \frac{5}{6}$ of what number?
9. Write seven and seven tenths in figures.
10. Find the perimeter of a 5 inch square.

Drill 31

4 times: .03, .02, .05, .06, .08, .09, .01, .04, .07

Divide by 4: .028, .004, .032, .020, .036, .012

Give the dividend the same number of decimal places as the divisor:

$.04\overline{)6.3}$ $.04\overline{)8.2}$ $.04\overline{)9.6}$ $.04\overline{)8.4}$ $.04\overline{)2.8}$ $.04\overline{)16}$
$.04\overline{)12}$ $.04\overline{)28}$ $.04\overline{)36}$ $.04\overline{)32}$

Multiply by 10, then by 100: .34, .21, .16, .32, .27, .18, .03, .07, .04, .06, .01, .08, .02

$\frac{1}{8}+\frac{1}{8}$ $\frac{1}{4}+\frac{1}{4}$ $\frac{1}{6}+\frac{1}{6}$ $\frac{1}{9}+\frac{2}{9}$ $\frac{1}{8}+\frac{3}{8}$

Mental 31

1. Find 4 × .07.
2. $4\overline{).036}$
3. Multiply .09 by 100.
4. $\frac{1}{8}+\frac{3}{4}$.
5. Find the perimeter of a rug 3 ft. by 4 ft.
6. How much larger than .05 is .5?
7. Write as a decimal the result of $\frac{1}{4}+\frac{1}{4}$.
8. Write the equivalent decimal for $\frac{9}{10}$.
9. Find $\frac{3}{8}$ of 8.
10. $8 = \frac{2}{3}$ of what number?

Drill 32

5 times: .08, .06, .09, .04, .02, .01, .03, .07, .05

Divide by 5: .25, .40, .35, .45, .20, .15, .30, .05, .10

Give the dividend the same number of decimal places as the divisor:

$1.04\overline{)3}$ $.04\overline{)5}$ $.4\overline{)6}$ $.04\overline{).5}$ $1.04\overline{)1.8}$ $.04\overline{).8}$
$1.04\overline{)1.6}$ $1.04\overline{)1.2}$ $1.04\overline{)5}$ $1.04\overline{).2}$

Multiply by 10, then by 100: 1.2, 1.8, 1.6 2.4, 3.6, 6.2, 5.4, 4.7, 8.3, 9.5, 4.3, 8.5, 9.2

$\frac{1}{6}+\frac{1}{6}$ $\frac{1}{6}+\frac{3}{6}$ $\frac{1}{6}+\frac{5}{6}$ $\frac{1}{6}+\frac{2}{6}$ $\frac{1}{6}+\frac{4}{6}$

Mental 32

1. Find $\frac{5}{8}$ of 16.
2. What fractional part of 20 is 5?
3. $12 = \frac{3}{4}$ of what number?
4. Write .8 as a fraction in lowest terms.
5. $5\overline{).25}$
6. Multiply .09 by 5.
7. Express $\frac{3}{5}$ as a decimal.
8. Betty sold $\frac{1}{2}$ dozen eggs for 30¢. How much a dozen was this?
9. A motor boat can go 7.8 miles an hour. How far will it go in 5 hours?
10. Write three hundred four and eight hundredths in figures.

Drill 33

6 times: .4, .5, .8, .3, .2, .9, .1, .6, .7

Divide by 6: 1.2, 1.8, 2.4, 4.2, 5.4, 3.6, 4.8, 3.0

Give the dividend the same number of decimal places as the divisor:

$.006\overline{)2}$ $.006\overline{)3}$ $.006\overline{)5}$ $.006\overline{)8}$ $.006\overline{)4}$

$.006\overline{).7}$ $.016\overline{).8}$ $.014\overline{).6}$ $.012\overline{).5}$ $.013\overline{).4}$

Multiply by 10, then by 100: .3, .5, .8, .9, .4, .2 .1, .7, .6, 1.3, 1.2, 1.4, 1.5, 1.8, 1.9, 1.6

$\frac{1}{9}+\frac{2}{9}$ $\frac{1}{9}+\frac{5}{9}$ $\frac{1}{9}+\frac{7}{9}$ $\frac{1}{12}+\frac{5}{12}$ $\frac{7}{12}+\frac{1}{12}$

Mental 33

1. Find $\frac{7}{9}$ of 63.
2. What fractional part of 18 is 3?
3. $9=\frac{3}{4}$ of what number?
4. Multiply $\frac{1}{2}$ by $\frac{1}{4}$.
5. Round 238 to the nearest hundred.
6. Peggy can walk $1\frac{1}{2}$ miles an hour. How far will she walk in 2 hours?
7. Find the perimeter of a window frame 2 ft. by 3 ft.
8. $1\frac{1}{8}$ lb. = (?) ounces.
9. To $\frac{5}{12}+\frac{1}{12}$ add $\frac{1}{2}$.
10. Write two thousand three and five tenths in figures.

Drill 34

7 times: .03, .06, .08, .04, .05, .02, .01, .09, .07

$7\overline{).49 \quad .28 \quad .07 \quad .35 \quad .56 \quad .42 \quad .21 \quad .63}$

Give the dividend the same number of decimal places as the divisor:

$.007\overline{).6}$ $.007\overline{).06}$ $.007\overline{)1.6}$ $.007\overline{)6}$

$.017\overline{).4}$ $.017\overline{)1.4}$ $.017\overline{)1.04}$ $.017\overline{)4}$

Multiply by 10, then by 100: 3, .3, .03, .003, 2, .2, .02, .002, 4, .4, .04, .004, 5, .5, .05, .005, 6, .6, .06, .006

From 1 take: $\frac{3}{5}$, $\frac{5}{7}$, $\frac{8}{9}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{5}{12}$, $\frac{5}{6}$, $\frac{7}{10}$, $\frac{1}{8}$

Mental 34

1. 7 times .09
2. $7\overline{).63}$
3. $.015\times100$
4. Add $\frac{1}{2}$ of $\frac{1}{8}$ to $\frac{7}{16}$.
5. Find the perimeter of a square 6 in. on a side.
6. Find $\frac{3}{4}$ of 12.
7. What fractional part of 20 is 4?
8. $15=\frac{3}{4}$ of what number?
9. How much larger than $\frac{1}{5}$ is $\frac{1}{4}$?
10. Write three and seventy-five thousandths in figures.

Drill 35

8 times: .2, .6, .8, .5, .7, .9, 0, .3, .4, .1

$7\overline{)1.4 \quad 2.8 \quad 3.5 \quad 4.2 \quad 6.3 \quad 2.1 \quad 5.6 \quad 4.9}$

Give the dividend the same number of decimal places as the divisor:

$1.2\overline{)8}$ $.12\overline{)8}$ $.012\overline{)8}$ $.012\overline{)68}$ $.03\overline{)8.1}$

$.65\overline{).3}$ $6.5\overline{)72}$ $.065\overline{)78.1}$ $1.62\overline{)7}$ $2.04\overline{)6}$

$\frac{1}{5}=\frac{?}{100}$ $\frac{2}{5}=\frac{?}{100}$ $\frac{3}{5}=\frac{?}{100}$ $\frac{4}{5}=\frac{?}{100}$ $\frac{5}{5}=\frac{?}{100}$

Multiply by 10, then by 100: 25, 2.5, .25, .025, 72, 7.2, .72, .072, 63, 6.3, .63, .063, 85, 8.5, .85, .085, 4.3, .43, .043

Mental 35

1. $7\overline{)4.9}$
2. Multiply 8 by .4
3. $\frac{3}{5}=\frac{?}{100}$
4. Multiply 8.43 by 100.
5. Find $\frac{3}{8}$ of 24.
6. What fractional part of 8 is 2?
7. 12 is $\frac{3}{4}$ of what number?
8. Which is larger .2 or $\frac{1}{4}$?
9. What is the area of a blackboard 3 ft. by 1 ft.?
10. Write four hundred three and thirty-six hundredths in figures.

Drill 36

9 times: .3, .4, .7, .9, .6, .5, .2, .8, 0, .1

$9\overline{)3.6\quad 6.3\quad 5.4\quad 7.2\quad 1.8\quad 2.7\quad 4.5\quad 8.1}$

$\frac{1}{4}=\frac{?}{100}\quad \frac{3}{4}=\frac{?}{100}\quad \frac{1}{10}=\frac{?}{100}\quad \frac{7}{10}=\frac{?}{100}\quad \frac{9}{10}=\frac{?}{100}$

$.2\overline{)2}\quad .6\overline{)6}\quad .2\overline{)8}\quad .2\overline{)4}\quad .3\overline{)3}\quad .3\overline{)6}\quad .3\overline{)9}$

$\frac{1}{20}=\frac{?}{100}\quad \frac{3}{20}=\frac{?}{100}\quad \frac{1}{25}=\frac{?}{100}\quad \frac{2}{25}=\frac{?}{100}$

Reduce to lowest terms: $\frac{10}{100}$, $\frac{20}{100}$, $\frac{30}{100}$, $\frac{40}{100}$, $\frac{50}{100}$, $\frac{60}{100}$, $\frac{70}{100}$, $\frac{80}{100}$, $\frac{90}{100}$, $\frac{25}{100}$, $\frac{75}{100}$, $\frac{5}{100}$, $\frac{4}{100}$, $\frac{2}{100}$

Multiply by 100: 63, 6.3, .63, .063, 6, .6, .06

Mental 36

1. Add .2 to 9 times .2
2. Express 4.1 as a mixed number.
3. $\frac{9}{10}=\frac{?}{100}$
4. Reduce $\frac{2}{100}$ to lowest terms.
5. Multiply .06 by 100.
6. $.3\overline{)9}$
7. Find $\frac{3}{4}$ of 8.
8. What fractional part of 8 is 2?
9. $15=\frac{3}{5}$ of what number?
10. In the number 36.24, the number of tenths is ..(?)..

Drill 37

.2 times: 3, 7, 9, 8, 5, 2, 4, 6, 1, 12

$2\overline{).36\quad .24\quad .16\quad .12\quad .14\quad .18\quad .22\quad .04\quad .06}$

$.3\overline{)9}\quad .4\overline{)8}\quad .2\overline{)10}\quad .5\overline{)10}\quad .3\overline{)12}\quad .4\overline{)12}$

Reduce to lowest terms: $1\frac{40}{100}$, $1\frac{80}{100}$, $1\frac{70}{100}$, $1\frac{50}{100}$, $1\frac{25}{100}$, $1\frac{10}{100}$, $1\frac{30}{100}$, $1\frac{60}{100}$, $1\frac{5}{100}$, $1\frac{4}{100}$, $1\frac{2}{100}$, $1\frac{75}{100}$, $1\frac{20}{100}$, $1\frac{90}{100}$

$\frac{3}{10}=\frac{?}{100}\quad \frac{7}{10}=\frac{?}{100}\quad \frac{9}{10}=\frac{?}{100}\quad \frac{1}{20}=\frac{?}{100}$

$\frac{1}{5}+0\quad 0+\frac{1}{5}\quad 0\times\frac{1}{5}\quad \frac{1}{5}-0\quad \frac{1}{10}\div\frac{1}{10}$

Multiply by 10: .3, .03, .003, 1.3, 1.6, .6, .06

Mental 37

1. To $\frac{1}{10}\div\frac{1}{10}$ add $\frac{1}{10}\times 0$
2. Reduce the fraction to lowest terms: $1\frac{90}{100}$
3. $.3\overline{)12}$
4. $4\overline{).16}$
5. $2\overline{).06}$
6. Multiply 1.6 by 10
7. If an agent collected $500 in rents, and charged $25 for his services, how much money was left for the owner?
8. $20=\frac{5}{6}$ of what number?
9. What part of 6 is 2?
10. In the number 85.04, the number of tens is ..(?)..

Drill 38

.3 times: 2, 6, 5, 9, 3, 7, 0, 4, 8, 12

$3\overline{).24\quad .12\quad .09\quad .18\quad .21\quad .27\quad .06\quad .03\quad .15\quad .36}$

$.3\overline{)6}\quad .3\overline{)3}\quad .3\overline{)12}\quad .3\overline{)9}\quad .3\overline{)15}\quad .3\overline{)18}\quad .3\overline{)21}$

Reduce to lowest terms: $\frac{2}{100}$, $\frac{4}{100}$, $\frac{6}{100}$, $\frac{8}{100}$, $\frac{10}{100}$, $\frac{12}{100}$, $\frac{14}{100}$, $\frac{16}{100}$, $\frac{18}{100}$, $\frac{20}{100}$, $\frac{22}{100}$, $\frac{24}{100}$, $\frac{26}{100}$, $\frac{28}{100}$

$\frac{1}{50}=\frac{?}{100}\quad \frac{3}{50}=\frac{?}{100}\quad \frac{7}{50}=\frac{?}{100}\quad \frac{9}{50}=\frac{?}{100}$

Multiply by 100: 1.16, 3.06, 8.04, 4.28, 2.03,

$\frac{3}{4}+0\quad \frac{3}{4}\times 0\quad \frac{3}{4}\div\frac{3}{4}\quad \frac{3}{4}\times\frac{3}{4}\quad \frac{3}{4}-\frac{3}{4}$

Mental 38

1. Multiply 1.16 by 100.
2. At $.09 a yard, how many yards of ribbon can be bought for $1.08?
3. Tom earns $60 a week. He spends $\frac{1}{3}$ of it for food and clothing. How much has he left?
4. $.3\overline{)21}$
5. Reduce $\frac{28}{100}$ to lowest terms.
6. Find the cost of $1\frac{1}{8}$ lbs. of meat at 72¢ a pound.
7. $\frac{7}{50}=\frac{?}{100}$
8. $(\frac{3}{4}+0)+(\frac{3}{4}\times 0)$
9. If 3 gallons of paint cost $32, find the cost of $1\frac{1}{2}$ gallons.
10. In the number 6.32, what is the value of 6?

Drill 39

As decimals: 65% 25%, 75%, 35%, 15%

$2\% = \frac{?}{100}$ $1\% = \frac{?}{100}$ $4\% = \frac{?}{100}$ $5\% = \frac{?}{100}$

$8\% = \frac{?}{100}$ $6\% = \frac{?}{100}$

$.02\overline{).4}$ $.02\overline{).8}$ $.02\overline{).6}$ $.02\overline{).2}$ $.03\overline{).6}$ $.03\overline{).9}$

Multiply by 100, then by 1000: 1.016, 2.304, 1.509, 1.115, 1.307, .608, .037, .952, .625

$\frac{3}{5}+\frac{3}{5}$ $\frac{3}{5}-\frac{3}{5}$ $\frac{3}{5}\times\frac{3}{5}$ $\frac{3}{5}\div\frac{3}{5}$ $\frac{3}{5}\times 0$

Express as feet: 8 in., 1 in., 4 in., 6 in., 3 in., 2 in., 10 in., 12 in.

As hours: 30 min., 20 min., 10 min., 40 min., 50 min., 15 min., 60 min.

Mental 39

1. $9\overline{).63}$
2. $.9\overline{)45}$
3. $(\frac{3}{5}-\frac{3}{5})+(\frac{3}{5}\div\frac{3}{5})$.
4. How many inches are there in 8 feet?
5. How many yards are there in 36 feet?
6. Express 75% as a decimal.
7. $6\% = \frac{?}{100}$
8. Multiply .724 by 1000.
9. Find $\frac{4}{5}$ of 20.
10. Write forty-four and thirteen hundredths in figures.

Drill 40

As decimals: 15%, 18%, 25%, 75%, 90%

Express as fractions: 75%, 50%, 20%, 80%, 10%

50% of 14, 18, 10, 12, 16, 24, 20

Add 9 to: 17, 25, 38, 54, 49, 62, 76

Take 9 from: 32, 65, 27, 89, 54, 73, 46, 28

$\frac{3}{8}+\frac{5}{8}$ $\frac{5}{8}\times\frac{5}{8}$ $\frac{8}{9}-\frac{2}{9}$ $\frac{5}{6}\div\frac{5}{6}$ $\frac{3}{7}\times 0$

As minutes: 20 sec., 10 sec., 15 sec., 30 sec., 45 sec., 50 sec., 60 sec.

As yards: 2 ft., 1 ft., 3 ft., 18 in., 36 in., 12 in., 24 in., 9 in.

Mental 40

1. Write 18% as a decimal.
2. Write 75% as a fraction.
3. Find 50% of 24.
4. Express 15 seconds as part of a minute.
5. Express 18 inches as part of a yard.
6. An airplane averaged 200 m.p.h. for 5 hours. How far did it go?
7. Tom has 73 marbles. Harry has 9 less than Tom. How many has Harry?
8. When apples are 6 for 28¢, what will 3 cost?
9. To $\frac{1}{8}$ of 32 add .3.
10. Write seventy-two and seventy-two thousandths.

Drill 41

As per cents: .20, .65, .25, .35, .15, .75, .45

As fractions: $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $16\frac{2}{3}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$

$33\frac{1}{3}\%$ of 18, 12, 21, 27, 6, 15, 24, 9, 36, 30

Reduce: $\frac{3}{21}$, $\frac{3}{36}$, $\frac{3}{27}$, $\frac{9}{36}$, $\frac{15}{30}$, $\frac{6}{24}$, $\frac{15}{27}$, $\frac{21}{30}$

Add 8 to: 16, 41, 78, 24, 39, 62, 75, 53, 87

Take 8 from: 32, 73, 51, 68, 14, 89, 15, 46, 87

$\frac{1}{2}+\frac{1}{4}$ $\frac{1}{3}-\frac{1}{6}$ $\frac{1}{4}-\frac{1}{8}$ $\frac{1}{8}\div\frac{1}{8}$ $\frac{1}{8}-0$

As lb.: 4 oz., 8 oz., 10 oz., 12 oz., 2 oz., 1 oz., 16 oz., 15 oz.

Mental 41

1. Write .45 as a per cent.
2. $.7\overline{)35}$
3. Write $16\frac{2}{3}\%$ as a fraction.
4. Find $33\frac{1}{3}\%$ of 36.
5. Reduce $\frac{21}{30}$ to lowest terms.
6. At 60 cents a lb., what will 4 ounces of candy cost?
7. An article costing \$63 is sold at a gain of \$8. What is the selling price?
8. Find the difference between $33\frac{1}{3}\%$ of 18 and $16\frac{2}{3}\%$ of 18.
9. Multiply 632.0 by 10.
10. How many hundreds are there in 134.25?

Drill 42

As per cents: .04, .02, .01, .05, .06, .08, .09, .03

As decimals: 7%, 9%, 6%, 3%, 1%, 4%, 2%

As fractions: 1%, 5%, 2%, 4%, 8%, 9%, 7%

25% of 40, 36, 72, 84, 24, 16, 60, 64, 96

Reduce: $\frac{4}{36}$, $\frac{4}{20}$, $\frac{8}{32}$, $\frac{24}{48}$, $\frac{8}{40}$, $\frac{4}{28}$, $\frac{12}{36}$, $\frac{16}{32}$

Add 7 to 15, 78, 43, 27, 83, 34, 56, 69

Take 7 from 35, 49, 76, 52, 87, 63, 18, 24, 91

As days: 12 hr., 4 hr., 6 hr., 2 hr., 3 hr., 1 hr., 24 hr., 18 hr., 30 hr., 48 hr.

Mental 42

1. Express .08 as a per cent.
2. Express 1% as a decimal.
3. Express 5% as a fraction in its lowest terms.
4. Take 25% of 32 from 25% of 40.
5. Reduce $\frac{12}{48}$ to its lowest terms, and express the result as a per cent.
6. $.4\overline{)32}$
7. What part of a day is 2 hours?
8. If 3 dozen cupcakes cost 90¢, what will $1\frac{1}{2}$ dozen cost?
9. Multiply 729.0 by 10.
10. Find the perimeter of a square $4\frac{1}{4}$ ft. on a side.

Drill 43

Express as per cents: $.12\frac{1}{2}$, $.16\frac{2}{3}$, $.08\frac{1}{3}$, $.06\frac{2}{3}$, $.14\frac{2}{7}$, $.11\frac{1}{9}$

Express as decimals: $12\frac{1}{2}\%$, $9\frac{1}{11}\%$, $14\frac{2}{7}\%$, $6\frac{2}{3}\%$, $8\frac{1}{3}\%$

Express as fractions: $14\frac{2}{7}\%$, $6\frac{2}{3}\%$, $8\frac{1}{3}\%$, $11\frac{1}{9}\%$, $16\frac{2}{3}\%$

Express as per cents: $\frac{1}{15}$, $\frac{1}{12}$, $\frac{1}{9}$, $\frac{1}{7}$, $\frac{1}{11}$, $\frac{1}{6}$, $\frac{1}{8}$

20% of 25, 35, 45, 15, 40, 50, 20, 60, 30

Reduce: $\frac{5}{50}$, $\frac{5}{45}$, $\frac{5}{40}$, $\frac{10}{60}$, $\frac{40}{50}$, $\frac{15}{30}$, $\frac{15}{25}$, $\frac{20}{30}$

Add 6 to 24, 51, 35, 69, 82, 76, 18, 43, 97

Take 6 from 15, 91, 46, 82, 27, 53, 78, 34, 69

Mental 43

1. Express $.08\frac{1}{3}$ as a per cent.
2. Express $14\frac{2}{7}\%$ as a decimal.
3. Express $16\frac{2}{3}\%$ as a fraction.
4. Express $\frac{1}{8}$ as a per cent.
5. Multiply 20% of 30 by 20% of 10.
6. What number is 6 less than 82?
7. When 5 yards of lace cost 42¢, what will $2\frac{1}{2}$ yards cost?
8. How many 6 oz. boxes can be filled with 8 lb. of candy?
9. Write the rule used to find the perimeter of a rectangle.
10. Express $\frac{3}{5}$ as a decimal.

Drill 44

Express as per cents: $.16\frac{2}{3}$, $.06\frac{1}{4}$, $.02\frac{1}{2}$, $.04\frac{1}{2}$, $.01\frac{1}{2}$, $.12\frac{1}{2}$

Express as decimals: $4\frac{1}{2}\%$, $37\frac{1}{2}\%$, $16\frac{2}{3}\%$, $12\frac{1}{2}\%$, $5\frac{1}{2}\%$, $6\frac{1}{4}\%$, $2\frac{1}{2}\%$

Express as per cents: $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{6}$, $\frac{3}{8}$, $\frac{1}{7}$, $\frac{1}{9}$, $\frac{1}{4}$, $\frac{1}{5}$

Express as fractions: 20%, 25%, $12\frac{1}{2}\%$, $16\frac{2}{3}\%$, $37\frac{1}{2}\%$, $6\frac{1}{4}\%$, $14\frac{2}{7}\%$

$16\frac{2}{3}\%$ of 12, 30, 54, 42, 72, 48, 36, 18, 24, 60

Reduce: $\frac{6}{36}$, $\frac{6}{18}$, $\frac{6}{72}$, $\frac{6}{54}$, $\frac{6}{48}$, $\frac{18}{36}$, $\frac{24}{48}$, $\frac{6}{60}$

Add 5 to: 23, 38, 41, 69, 85, 52, 16, 74, 97

Take 5 from: 36, 51, 87, 62, 98, 73, 29, 45, 19

Mental 44

1. Express $.06\frac{1}{4}$ as a per cent.
2. Express $37\frac{1}{2}\%$ as a decimal.
3. Express $\frac{1}{6}$ as a per cent.
4. Take $16\frac{2}{3}\%$ of 24 from $16\frac{2}{3}\%$ of 30.
5. Express $14\frac{2}{7}\%$ as a fraction.
6. Mr. Nelson's salary is $240. His expenses are $210. How much can he save?
7. $.07\overline{).21}$
8. $20 = \frac{4}{5}$ of what number?
9. A dealer sold a $3 sweater for $2.40. What was the reduction?
10. Write four hundred two and four hundred two thousandths.

Drill 45

Express as per cents: .04, .01, .08, .09, .06, $.06\frac{2}{3}$, $.08\frac{1}{3}$, $.06\frac{1}{4}$, $.02\frac{1}{2}$, $.01\frac{1}{4}$

Express as decimals: $6\frac{1}{4}\%$, 6%, 9%, 8%, $6\frac{2}{3}\%$, $8\frac{1}{3}\%$, $16\frac{2}{3}\%$, $12\frac{1}{2}\%$

Express as per cents: $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{20}$, $\frac{1}{25}$, $\frac{1}{50}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{12}$, $\frac{1}{16}$, $\frac{1}{15}$

Express as fractions: 25%, 2%, 20%, 4%, 5%, $16\frac{2}{3}\%$, $6\frac{1}{4}\%$, $8\frac{1}{3}\%$

$14\frac{2}{7}\%$ of: 14, 49, 28, 63, 70, 35, 56, 21, 42

Reduce: $\frac{7}{49}$, $\frac{7}{63}$, $\frac{7}{42}$, $\frac{7}{28}$, $\frac{7}{56}$, $\frac{21}{35}$, $\frac{14}{49}$, $\frac{35}{84}$

Add 4 to: 24, 57, 61, 35, 42, 78, 93, 86, 19

Take 4 from: 37, 21, 56, 72, 18, 43, 89, 94, 65

Mental 45

1. Express $.08\frac{1}{3}$ as a per cent.
2. Express $6\frac{2}{3}\%$ as a decimal.
3. Express $\frac{1}{5}$ as a per cent.
4. Take $14\frac{2}{7}\%$ of 63 from 12.
5. What number is .4 more than 7.8?
6. At $.30 a half dozen, find the cost of 2 dozen eggs.
7. Multiply .03 by .04.
8. In a class of 40 pupils, 10% are absent. How many are present?
9. If my bill amounts to $9.60, what change shall I receive from $10?
10. In the number 4.62 there are (?) tenths?

Drill 46

Express as per cents: $.08\frac{1}{3}$, $.16\frac{2}{3}$, $.33\frac{1}{3}$, $.66\frac{2}{3}$, $.06\frac{1}{4}$, $.12\frac{1}{2}$, $.37\frac{1}{2}$, $.62\frac{1}{2}$

Express as decimals: $6\frac{1}{4}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$, $8\frac{1}{3}\%$, $16\frac{2}{3}\%$, $33\frac{1}{3}\%$

Express as per cents: $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$

Express as fractions: $6\frac{1}{4}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$, $8\frac{1}{3}\%$, $16\frac{2}{3}\%$, $14\frac{2}{7}\%$, $11\frac{1}{9}\%$, $9\frac{1}{11}\%$

$12\frac{1}{2}\%$ of 24, 40, 56, 72, 48, 32, 64, 16, 8

Reduce: $\frac{8}{40}$, $\frac{8}{56}$, $\frac{8}{72}$, $\frac{8}{48}$, $\frac{8}{64}$, $\frac{16}{24}$, $\frac{32}{64}$, $\frac{8}{96}$

Add 3 to: 13, 97, 89, 71, 24, 56, 32, 65, 48

Take 3 from: 21, 65, 98, 32, 86, 49, 13, 57, 74

Mental 46

1. Express $.07\frac{1}{3}$ as a per cent
2. Express $6\frac{1}{4}\%$ as a decimal.
3. Express $\frac{1}{3}$ as a per cent.
4. Express $12\frac{1}{2}\%$ as a fraction.
5. Take $12\frac{1}{2}\%$ of 64 from 20% of 50.
6. $.08\overline{)\,.72}$
7. Multiply .06 by .04.
8. When rolls are 45¢ a dozen, how much will 4 cost?
9. How many days are 3 less than 2 weeks?
10. How many $\frac{1}{2}$ foot lengths can be cut from 6 feet of wire?

Drill 47

Express as per cents: $.14\frac{2}{7}$, $.11\frac{1}{9}$, $.09\frac{1}{11}$, .15, .04, .02, .01, $.08\frac{1}{3}$

Express as decimals: 15%, 4%, $14\frac{2}{7}\%$, $8\frac{1}{3}\%$, $9\frac{1}{11}\%$, 2%, $11\frac{1}{9}\%$

Express as per cents: $\frac{1}{9}$, $\frac{1}{11}$, $\frac{1}{7}$, $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{20}$, $\frac{1}{50}$, $\frac{1}{100}$, $\frac{3}{20}$

Express as fractions: 4%, 15%, $11\frac{1}{9}\%$, $14\frac{2}{7}\%$, $9\frac{1}{11}\%$, $16\frac{2}{3}\%$, 2%

$11\frac{1}{9}\%$ of: 36, 54, 72, 18, 45, 27, 63, 81, 108

Reduce: $\frac{9}{63}$, $\frac{9}{45}$, $\frac{9}{81}$, $\frac{9}{72}$, $\frac{18}{27}$, $\frac{36}{45}$, $\frac{63}{81}$

Add 2 to: 19, 43, 25, 51, 36, 78, 62, 87, 94

Take 2 from: 47, 81, 26, 92, 38, 73, 19, 54, 65

Mental 47

1. Express $\frac{1}{50}$ as a per cent.
2. Express $11\frac{1}{9}\%$ as a fraction.
3. Find $11\frac{1}{9}\%$ of 72, and multiply the result by 4.
4. How many inches more than 1 yard is $1\frac{1}{3}$ yards?
5. Divide 36 by .9.
6. Multiply .04 by .3.
7. What will 150 post cards cost at 2¢ each?
8. A reduction of $2 from the original price brings the selling price of a bag to $12. What was the original price?
9. A floor is 16 feet long. Its width is 75% of this. What is its width?
10. If 5yds. of ribbon cost $.90, what will $2\frac{1}{2}$ yds.cost?

Drill 48

Express as per cents: .5, .2, .3, .6, .4, .8, .7, .1, .9, 1.04, 1.03, 1.02, 1.00, 1.01, 1.05, 1.06, 1.08

Express as decimals: 40%, 90%, 50%, 20%, 5%, 4%, 2%, 3%, 1%

Express as fractions: 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%

10% of: 80, 60, 20, 90, 70, 30, 10, 40, 50, 100

Reduce: $\frac{80}{100}$, $\frac{60}{100}$, $\frac{70}{100}$, $\frac{30}{100}$, $\frac{50}{100}$, $\frac{20}{100}$, $\frac{10}{100}$, $\frac{40}{100}$, $\frac{90}{100}$

Add .2 to: .9, .5, .7, .1, .6, .2, .8, .3, .4

Take .2 from: 1.4, 1.6, 1.1, 1.7, 1.2, 1.8, 1.3, 1.5, 1.9

Mental 48

1. Express .9 as a per cent.
2. Express 104% as a mixed decimal.
3. Multiply 10% of 90 by 5.
4. Divide 64 by .8.
5. Multiply .07 by .5.
6. Find the area of a square 9 feet on a side.
7. Joseph spelled 20 words correctly out of 25. What per cent of the words did he misspell?
8. Bob had \$.96. He spent $12\frac{1}{2}\%$ of it. How much did he spend?
9. How many inches are there in $8\frac{1}{3}\%$ of 1 yard?
10. Write six and eighty-nine thousandths in figures.

Drill 49

Express as per cents: .06, 1.06, .08, 1.08, .09, 1.09, 1.04, $.12\frac{1}{2}$, $.06\frac{1}{4}$, $.08\frac{1}{3}$, $.01\frac{1}{2}$, $.02\frac{1}{4}$, $.16\frac{2}{3}$, $.11\frac{1}{9}$

Express as decimals: $3\frac{1}{2}\%$, 8%, 28%, 4%, 9%, $9\frac{1}{11}\%$

Express as fractions: 25%, 75%, 50%, 20%, 10%, 40%, 60%, 80%, $14\frac{2}{7}\%$, $11\frac{1}{9}\%$, $9\frac{1}{11}\%$, $16\frac{2}{3}\%$, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$

$9\frac{1}{11}\%$ of: 55, 33, 88, 44, 11, 66, 99, 22, 77, 110

Reduce: $\frac{11}{55}$, $\frac{11}{66}$, $\frac{11}{22}$, $\frac{11}{88}$, $\frac{11}{99}$, $\frac{11}{33}$, $\frac{11}{44}$, $\frac{11}{77}$, $\frac{22}{44}$

$1\frac{1}{4}+\frac{3}{4}$ $\quad 2\frac{5}{6}+\frac{1}{6}$ $\quad 2\frac{1}{2}+\frac{1}{4}$ $\quad 3\frac{1}{6}+\frac{2}{3}$ $\quad 4-\frac{5}{6}$

Mental 49

1. $.07\overline{)14}$
2. .03 times .02
3. Express $33\frac{1}{3}\%$ as a fraction.
4. Find $9\frac{1}{11}\%$ of 66, and divide it by 2.
5. In percentage problems, the percentage is always a .....(?)..... (factor, product)
6. A train is due at 3:20 P.M. If it is 30 minutes late, at what time will it arrive?
7. In a basket containing 160 apples, $12\frac{1}{2}\%$ are decayed. How many are decayed?
8. What per cent expresses 10% less than 100%?
9. What per cent of 1 yard is 1 foot?
10. How many tens are there in 604.24?

Drill 50

$8\frac{1}{3}\%$ of: 36, 72, 108, 12, 48, 96, 24, 60, 84, 120

$33\frac{1}{3}\%$ of: 120, 150, 270, 90, 240, 180, 210, 60

$11\frac{1}{9}\%$ of: 180, 450, 90, 540, 270, 630, 360, 720, 810

$16\frac{2}{3}\%$ of: 240, 360, 480, 60, 300, 540, 120, 420, 180

What fractional part of 12 is: 3, 12 is 4, 27 is 3, 27 is 9, 15 is 3, 15 is 5, 20 is 4, 20 is 5, 30 is 3

Give the value of: XX, XXV, XXIV, XXVI, XXIX

Mental 50

1. Express $8\frac{1}{3}\%$ as a fraction.
2. To $33\frac{1}{3}\%$ of 120 add 10.
3. One rectangle has an area of 150 sq. ft. Another is only 10% as large in area. What is the area of the second?
4. In percentage problems, the rate is always a .....(?)..... (factor, product)
5. To find the percentage, the process is always .....(?).....
6. What per cent expresses 5% below 100%?
7. The net price of an article is always .....(?)..... than the marked price.
8. $.04\overline{)1.64}$.
9. $\frac{1}{2}(.4\times8)$
10. The multiplicand is .6; the multiplier is 2; the product is .....(?).....

Drill 51

How many nickels in: 1 dollar, 50 cents, 1 quarter, 2 quarters, 1 dime, 2 dimes, 3 dimes, 4 dimes, 5 dimes, 6 dimes, 3 quarters, 75 cents, 25 cents?

What fractional part of a dollar is: 5¢, 25¢, 50¢, 75¢, 80¢, 10¢, 90¢, 70¢, 40¢, 20¢, 60¢, 30¢, 4¢, 2¢, 1¢, $12\frac{1}{2}$¢, $37\frac{1}{2}$¢, $87\frac{1}{2}$¢?

How many half dollars in: $1.00, $2.00, $1.50, $3.00, $2.50, $4.00, $3.50, $5.00, $5.50, $4.50, $10.00, $8.00, $9.00?

Add 25¢ to: $.75, $.25, $1.25, $1.75, $1.50, $2.00

Give the value of: XXX, XL, XLI, XLIV, XLVI

Mental 51

1. Express $8\frac{1}{3}\%$ as a fraction.
2. Find $6\frac{1}{4}\%$ of 32.
3. How many nickels in 2 quarter-dollars?
4. What per cent of a dollar is 80¢?
5. Add 25¢ to $1.25.
6. The storekeeper gave Tom $.75 in change. Tom received from him 2 quarter-dollars, 1 dime and (?) nickels.

From 7 to 10 which are *factors* and which are *products*?

7. In discount problems, the discount is a (?);
8. the rate of discount is a (?);
9. the net price is a (?);
10. the list price is a (?).

Drill 52

How many quarter-dollars in: 50¢, 25¢, 75¢, $1.00, $1.50, $1.25, $2.00?

How many minutes in: $\frac{1}{2}$ hr., $\frac{1}{5}$ hr., $\frac{1}{3}$ hr., $\frac{1}{10}$ hr., $\frac{1}{4}$ hr., $\frac{1}{12}$ hr., $\frac{1}{30}$ hr.?

How many weeks in: 35 da., 42 da., 14 da., 49 da., 21 da., 63 da., 84 da., 70 da.?

How many inches in: $\frac{1}{2}$ ft., $\frac{1}{3}$ ft., $\frac{1}{4}$ ft., $\frac{1}{12}$ ft., $\frac{1}{6}$ ft., $\frac{2}{3}$ ft., $\frac{3}{4}$ ft., $\frac{5}{6}$ ft.?

Months in: $\frac{1}{2}$ yr., $\frac{1}{3}$ yr., $\frac{1}{6}$ yr., $\frac{1}{12}$ yr., $\frac{1}{4}$ yr., $1\frac{1}{2}$ yrs., $1\frac{1}{12}$ yrs., $1\frac{1}{6}$ yrs.?

Ounces in: $\frac{1}{8}$ lb., $\frac{1}{2}$ lb., $\frac{1}{4}$ lb., $\frac{1}{16}$ lb., $\frac{3}{4}$ lb., $1\frac{1}{2}$ lbs., $1\frac{1}{16}$ lbs., $1\frac{1}{4}$ lbs.?

1 qt. = (?) pts. $1\frac{1}{2}$ qts. = (?) pts. 2 qts. = (?) pts.

Give the value of: XL, L, LV, LIV, LVI, LVII, LIX

Mental 52

1. To divide 6 by $\frac{1}{2}$ is the same as multiplying 6 by (?).
2. To take $\frac{1}{2}$ of 6 is the same as dividing 6 by (?).
3. $6 \div \frac{1}{2} =$ (?).
4. $\frac{1}{2}$ of 6 = (?).
5. How many quarters are there in $1.50?
6. What is saved by buying a dress marked $18 if it is reduced $16\frac{2}{3}\%$?
7. What per cent expresses $12\frac{1}{2}\%$ below 100%?
8. A rug marked $60 is reduced $10. What is the rate of discount?
9. How many times $1\frac{1}{4}$ is $2\frac{1}{2}$?
10. When $2\frac{1}{2}$ lb. of tea cost $1.60, what will $1\frac{1}{4}$ lb. cost?

Drill 53

Express as per cents: .4, .3, .2, .5, .6, .8, .9, 1.1, 1.3, 1.8, 1.9, 1.2, 1.4, 1.6, 1.5, 1.7

Express as decimals: 20%, 80%, 75%, 5%, 4%, 15%, 25%, 2%

As fractions: 20%, 40%, 80%, 60%, 90%, 5%, 4%, 2%

$.03\frac{1}{3} = \frac{?}{100}$ $.06\frac{2}{3} = \frac{?}{100}$ $.08\frac{1}{3} = \frac{?}{100}$ $.12\frac{1}{2} = \frac{?}{100}$

Give the value of: LXX, LXXX, XC, C, CX, CXX, CXXX, CXL, CL, CLX

Mental 53

1. To divide 18 by 2 is the same as multiplying 18 by (?).
2. To take $\frac{1}{2}$ of 18 is the same as dividing 18 by (?).
3. $\frac{1}{2}$ of 18 = (?).
4. $18 \div \frac{1}{2} =$ (?).
5. How many months are there in $\frac{1}{6}$ year?
6. How many times $1\frac{1}{8}$ is $2\frac{1}{4}$?
7. If $2\frac{1}{4}$ lbs., of candy cost $1.60, what will $1\frac{1}{8}$ lbs. cost?
8. When the marked price is $24, and the rate of discount is $33\frac{1}{3}\%$, what is the net price?
9. What is the rate of discount when the list price is $30, and the net price is $27?
10. Write CXXX in Arabic numbers.

Drill 54

Express as per cents: $.03\frac{1}{3}$, $.06\frac{2}{3}$, $.08\frac{1}{3}$, $.16\frac{2}{3}$, $.14\frac{2}{7}$, $.12\frac{1}{2}$, .5, .05, .2, .02, .3, .03, .4, .04, .6, .06

Express as decimals: $6\frac{2}{3}\%$, $12\frac{1}{2}\%$, $3\frac{1}{3}\%$, $8\frac{1}{3}\%$, $16\frac{2}{3}\%$, $6\frac{1}{4}\%$, 2%, 5%, 20%, 50%, 4%, 40%, 6%, 60%, 3%, 30%

Express as fractions: 5%, 4%, 40%, 80%, 90%, 20%, 30%, 25%, 75%, 50%, 60%

From 1 take: .5, .3, .2, .8, .4, .7, .6, .1, .9

Add .1 to: .9, .09, 1.9, 1.09, 2.9, 2.09, 3.9, 3.09

Give the value of: CLX, CLXX, CLXXX, CXC, CC

Mental 54

1. To divide 75 by $\frac{1}{3}$ is the same as multiplying 75 by ......(?)......
2. To take $\frac{1}{3}$ of 75 is the same as dividing 75 by ......(?)......
3. $75 \div 3 =$ ......(?)......
4. $\frac{1}{3}$ of $75 =$ ......(?)......
5. What is the gain when the cost is $75, and the rate of gain is $33\frac{1}{3}\%$?
6. Find the rate of gain if an article bought for $60 is sold for $10 above the cost.
7. In profit and loss problems, the gain is always a ......(?)...... (product, factor).
8. Write 4% as a fraction in lowest terms.
9. Write .2 as a per cent.
10. Write CLXX in Arabic numbers.

Drill 55

Divide by $\frac{1}{2}$: 4, 7, 9, 2, 5, 8, 1, 6, 10, 3, 12

50% of: 8, 12, 2, 10, 16, 20, 4, 14, 24, 6, 18

As per cents: .3, .03, 1.03, .5, .05, 1.05, $.06\frac{1}{4}$, $.03\frac{1}{3}$, $.06\frac{2}{3}$, $.08\frac{1}{3}$, $.02\frac{1}{2}$, $.16\frac{2}{3}$, $.12\frac{1}{2}$, $.33\frac{1}{3}$

As fractions: $33\frac{1}{3}\%$, $12\frac{1}{2}\%$, $16\frac{2}{3}\%$, $8\frac{1}{3}\%$, $6\frac{2}{3}\%$, $37\frac{1}{2}\%$, 20%, 40%, 60%, 80%, 90%, 25%, 50%, 75%

From 2 take: $1\frac{1}{2}$, $1\frac{3}{5}$, $1\frac{4}{9}$, $1\frac{1}{6}$, $1\frac{4}{7}$, $1\frac{7}{8}$, $1\frac{2}{3}$

Give the value of: CC, CCC, CD, D, DC, DCC, DCCC

Mental 55

1. To divide 20 by $\frac{1}{2}$ is the same as multiplying 20 by ......(?)......
2. To take $\frac{1}{2}$ of 24 is the same as dividing 24 by ......(?)......
3. Divide 40 by $\frac{1}{2}$.
4. Take $\frac{1}{2}$ of 60.
5. To 50% of 18 add 10.
6. Express $6\frac{2}{3}\%$ as a fraction.
7. From 2 take $1\frac{3}{5}$.
8. When the selling price is $12, and the gain is $2, what is the rate of gain?
9. A television set marked $300 is reduced 20%. What is the discount?
10. Write CD in Arabic numbers.

Drill 56

Divide by $\frac{1}{3}$: 3, 5, 8, 10, 1, 4, 7, 2, 6, 9

$33\frac{1}{3}\%$ of: 3, 5, 8, 10, 1, 4, 7, 2, 6, 9

Express as decimals: 10%, 20%, 30%, 15%, 25%, 5%, 4%, 2%, 1%, 8%, $8\frac{1}{3}\%$, $6\frac{1}{4}\%$, $4\frac{1}{2}\%$, $6\frac{2}{3}\%$, $16\frac{2}{3}\%$, $12\frac{1}{2}\%$

Express as fractions: 20%, 40%, 60%, 80%, 90%, $6\frac{2}{3}\%$, $16\frac{2}{3}\%$, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$, $14\frac{2}{7}\%$, $11\frac{1}{9}\%$

From 1 take: .5, .3, .9, .8, .6, .25, .75

Give the value of: DCCC, CM, M, MC, MCC

Mental 56

1. To divide 120 by $\frac{1}{3}$ is the same as multiplying 120 by ......(?)......
2. To take $\frac{1}{3}$ of 48 is the same as dividing 48 by ......(?)......
3. Divide 12 by $33\frac{1}{3}\%$.
4. $(33\frac{1}{3}\%$ of $15) + (16\frac{2}{3}\%$ of $12)$
5. From 1 take .25.
6. $2(1 - \frac{4}{5})$
7. A dress marked $16 is sold for $12. What is the rate of discount?
8. A house which cost $9000 is sold for $8000. What is the rate of reduction?
9. The cost is $100; the selling price is $120. Find the rate of gain.
10. Give the value of MC in Arabic numbers.

Drill 57

Divide by $\frac{1}{4}$: 8, 2, 4, 3, 9, 1, 7, 5, 6, 10

25% of: 12, 20, 28, 40, 16, 32, 8, 24, 36, 48

Express as decimals: 16%, 24%, 32%, 18%, 36%, 42%, 6%, 5%, 2%, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $87\frac{1}{2}\%$, $62\frac{1}{2}\%$, $12\frac{1}{2}\%$

Express as fractions: 25%, 75%, 10%, $12\frac{1}{2}\%$, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $6\frac{1}{4}\%$, $8\frac{1}{3}\%$, $6\frac{2}{3}\%$, 5%, 4%, 2%, 1%

From 1 take: .6, .4, .3, .5, .2, .8, .7, .9, .1

Give the value of: MCCC, MCD, MD, MDC, MDCC

Mental 57

1. $(6 \div \frac{1}{4}) - 8$
2. $(25\% \text{ of } 48) \div 3$
3. When a dealer buys for $16 and sells for $18, what is the rate of gain?
4. When property bought for $600 is sold for $500, what is the rate of loss?
5. Books listed at $1.20 are sold for 25% less. What is the discount?
6. A radio marked $42 is sold for $6 less. What is the rate of reduction?
7. $(2 - .9) \times (3 \times 0)$
8. $.7\overline{)42}$
9. $.06 \times .02$
10. Write MDC in Arabic numbers.

Drill 58

Divide by $\frac{1}{5}$: 2, 5, 7, 1, 8, 3, 4, 6, 9, 12

20% of: 25, 35, 15, 30, 45, 10, 40, 50, 20, 60

Express as per cents: .12, .15, .25, .05, .04, $.06\frac{1}{4}$, $.08\frac{1}{3}$

Express as decimals: 40%, 4%, 5%, 2%, 3%, 6%, 8%, 1%, $6\frac{1}{4}\%$, $16\frac{2}{3}\%$, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$, $12\frac{1}{2}\%$

Express as fractions: 20%, 60%, 30%, 40%, 80%, 90%, 25%, 75%, $12\frac{1}{2}\%$, $16\frac{2}{3}\%$, $6\frac{2}{3}\%$, $8\frac{1}{3}\%$

Express in Arabic numbers: MDCC, MDCCC, MCM, MCML, MCMX

Mental 58

1. $(12 \div \frac{1}{5}) \div 20$
2. $(20\% \text{ of } 30) \times 2$
3. How much more than $\frac{1}{25}$ of 50 is $\frac{1}{20}$ of 60?
4. Write $6\frac{1}{4}\%$ as a fraction.
5. How often can you cut $\frac{3}{4}$ yd. of wire from 6 yards?
6. If $\frac{3}{4}$ dozen rolls cost $.24, what will $1\frac{1}{2}$ dozen cost?
7. How many square yards are there in a floor 10 ft. by 9 ft.?
8. What is the gain when $60 is the cost and $16\frac{2}{3}\%$ is the rate of gain?
9. The cost price of an article is 90¢, and $11\frac{1}{9}\%$ is the rate of loss. What is the selling price?
10. Write MCM in Arabic numbers.

Drill 59

Divide by $\frac{1}{6}$: 4, 8, 12, 3, 5, 2, 7, 6, 9

$16\frac{2}{3}\%$ of: 18, 54, 24, 36, 12, 48, 30, 42, 72

As fractions: .75, .25, .4, .6, .8, .2, .9, .1, .3

As mixed numbers: 1.1, 1.9, 1.8, 1.4, 1.75, 1.25, 1.6, 1.5

$.6\overline{)12}$ $.6\overline{)18}$ $.6\overline{)42}$ $.6\overline{)54}$ $.6\overline{)48}$ $.6\overline{)30}$

.6 times: 8, 4, 5, 7, 9, 3, 6, 2, 1

Square yards: 9 sq. ft., 3 sq. ft., 4 sq. ft., 6 sq. ft., 2 sq. ft., 1 sq. ft.

In Arabic numbers: MCD, MD, MDL, MDLX, MDLXX

Mental 59

1. $(72 \div 6) - 10$
2. $(16\frac{2}{3}\% \text{ of } 54) \times 3$
3. $.6\overline{)42}$
4. Multiply 8 by .6
5. What part of a square yard are 6 square feet?
6. A boy bought a bicycle for $35 and sold it for $40. What per cent did he gain?
7. How much a month is $3600 a year?
8. An agent collected rents to the amount of $500 and received a commission of 2%. What was his commission?
9. How many times is $\frac{7}{8}$ contained in $1\frac{3}{4}$?
10. Write MDLX in Arabic numbers.

Drill 60

Divide by $\frac{1}{7}$: 4, 8, 6, 2, 5, 10, 1, 7, 3, 9

$14\frac{2}{7}\%$ of: 21, 63, 35, 49, 14, 42, 28, 56, 70

Express as per cents: .25, .2, .4, .6, .8, 1.25, 1.75, 1.85

Express as decimals: 25%, 75%, 60%, 125%, 175%, 135%, 132%, 105%, 185%, 190%, 140%, 120%, 110%, 150%

Express as fractions: 30%, 25%, 60%, 80%, 40%, 20%, 10%, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$, $62\frac{1}{2}\%$, $87\frac{1}{2}\%$, $33\frac{1}{3}\%$ $66\frac{2}{3}\%$, $16\frac{2}{3}\%$

Express as Arabic numbers: MD, MDL, MDLX, MDLIV, MDLV

Mental 60

1. $(8 \div \frac{1}{7}) - 6$
2. $(14\frac{2}{7}\% \text{ of } 35) \times 3$
3. Write 1.75 as a per cent.
4. Write 105% as a decimal.
5. What per cent of 70 is 7?
6. How long will 5lbs. of tea last if $\frac{1}{4}$ lb. is used each day?
7. Share $63 equally among 7 people.
8. A commission of 10% of $400, plus $30 weekly allowance equals ...(?)... weekly salary.
9. Rate of gain $16\frac{2}{3}\%$; cost $240. Find gain.
10. Write MDLIV in Arabic numbers.

Drill 61

Divide by $\frac{1}{8}$: 3, 6, 8, 1, 2, 5, 0, 4, 7, 9, 12

$12\frac{1}{2}\%$ of: 48, 32, 56, 96, 8, 64, 16, 40, 72, 24

$\frac{2}{5}=\frac{?}{40}$ $\frac{3}{5}=\frac{?}{25}$ $\frac{4}{5}=\frac{?}{45}$ $\frac{1}{5}=\frac{?}{35}$ $\frac{5}{5}=\frac{?}{20}$

Express as mixed numbers: $\frac{63}{8}$, $\frac{73}{8}$, $\frac{55}{8}$, $\frac{49}{8}$, $\frac{45}{8}$, $\frac{33}{8}$

Express as per cents: .15, .25, .17, 1.15, 1.25, 1.75

Express as decimals: 20%, 120%, 2%, 50%,

Express as fractions: 2%, 5%, 4%, 3%, 1%, 8%

Express as Arabic numbers: MDLX, MDLXV, MDLXVI, MDLXIX, MM

Mental 61

1. $(9 \div \frac{1}{6}) - 4$
2. $(12\frac{1}{2}\% \text{ of } 48) \div 2$
3. Express 1.25 as a per cent.
4. Express 150% as a decimal.
5. What fraction does 2% equal?
6. How many times $\frac{1}{4}$ is $1\frac{1}{4}$?
7. If $\frac{1}{4}$ lb. cost $.20, what will $1\frac{1}{4}$ lb. cost?
8. When a lot is bought for $640 and resold for $800, what is the gain?
9. Find the selling price of a piano bought for $600 and sold for 10% above the cost.
10. Write MDLXVI in Arabic numbers.

Drill 62

Divide by $\frac{1}{9}$: 3, 7, 5, 9, 1, 6, 0, 4, 8, 12

$11\frac{1}{9}\%$ of: 36, 18, 45, 63, 9, 54, 72, 27, 81, 108

$11\frac{1}{9}\%$ of: 450, 90, 630, 720, 810, 270, 540, 360

$$\frac{1}{9}=\frac{?}{81}=\frac{?}{45}=\frac{?}{27}=\frac{?}{72}=\frac{?}{36}=\frac{?}{63}=\frac{?}{54}=\frac{?}{18}$$

$$\frac{2}{9}=\frac{?}{36}=\frac{?}{54}=\frac{?}{45}=\frac{?}{63}=\frac{?}{27}=\frac{?}{72}=\frac{?}{81}=\frac{?}{18}$$

Reduce: $\frac{9}{81}$, $\frac{9}{63}$, $\frac{9}{72}$, $\frac{9}{108}$, $\frac{18}{45}$, $\frac{36}{72}$, $\frac{27}{81}$, $\frac{45}{90}$

Express as fractions: $16\frac{2}{3}\%$, $11\frac{1}{9}\%$, $9\frac{1}{11}\%$, $12\frac{1}{2}\%$, $14\frac{2}{7}\%$, $6\frac{1}{4}\%$, $8\frac{1}{3}\%$

Express as Arabic numbers: MM, MCM, MDCCC, MDCX, MCD

Mental 62

1. $(7 \div \frac{1}{9}) + 4$
2. $(11\frac{1}{9}\% \text{ of } 72) \div 2$
3. Express $6\frac{1}{4}\%$ as a fraction.
4. If $11\frac{1}{9}\%$ of 27 equals 3, what does $\frac{4}{9}$ of 27 equal?
5. What fractional part of 1 foot is 4 inches?
6. How many times $\frac{1}{3}$ is $1\frac{2}{3}$?
7. If $\frac{1}{3}$ ft. of wire is used to bead a bracelet, how many bracelets can be made from $1\frac{2}{3}$ ft.?
8. What is the net price of a table marked $40, and reduced 20%?
9. If the cost is $18, and the rate of gain $16\frac{2}{3}\%$, what is the gain?
10. Write MDCCC in Arabic numbers.

Drill 63

Divide by $\frac{1}{10}$: 2, 7, 4, 1, 9, 5, 0, 8, 3, 6, 10

10% of: 10, 40, 70, 100, 20, 50, 80, 30, 60, 90

$\frac{1}{10}=\frac{?}{30}=\frac{?}{70}=\frac{?}{80}=\frac{?}{90}=\frac{?}{100}=\frac{?}{40}=\frac{?}{60}$

$\frac{3}{10}=\frac{?}{70}=\frac{?}{90}=\frac{?}{100}=\frac{?}{60}=\frac{?}{40}=\frac{?}{80}=\frac{?}{50}$

Improper fractions: $3\frac{1}{10}$, $5\frac{3}{10}$, $8\frac{1}{10}$, $1\frac{9}{10}$, $4\frac{7}{10}$, $8\frac{3}{10}$, $9\frac{1}{10}$

Express as mixed numbers: 120%, 130%, 125%, 110%, 150%, 190%

Express as per cents: $1\frac{1}{4}$, $1\frac{9}{10}$, $1\frac{1}{5}$, $1\frac{1}{2}$, $1\frac{3}{10}$, $1\frac{2}{10}$, $1\frac{2}{5}$

Express as Arabic numbers: MCD, MDC, MDCCC, MDCC, MCM

Mental 63

1. $(6 \div \frac{1}{10}) \div 3$
2. $(10\% \text{ of } 80) \div 2$
3. Express 120% as a decimal.
4. Express $1\frac{1}{5}$ as a per cent.
5. How many yards are there in 10 rods?
6. In commission problems, the commission is a ......(?)...... (factor or product)
7. Another way of expressing $.12\frac{1}{2}$ as a decimal is ......(?)......
8. How many times $8\frac{1}{3}\%$ is $16\frac{2}{3}\%$?
9. If 20% of 30 is 6, what is 40% of 30 equal to?
10. Write MDCC in Arabic numbers.

Drill 64

Divide by $\frac{1}{11}$: 5, 2, 6, 1, 4, 9, 0, 7, 3, 8, 10

$9\frac{1}{11}\%$ of: 22, 77, 44, 110, 55, 11, 99, 66, 88

Express as per cents: .5, .2, .3, .4, .7, .9, .8, .1, .05, .04

Express as decimals: 25%, 75%, 6%, 4%, 5%, 8%, 9%, 2%

Express as fractions: 20%, 30%, 40%, 50%, 60%, 80%, 70%, 90%

$.9\overline{)3.6}$ $.9\overline{)2.7}$ $.9\overline{)4.5}$ $.9\overline{)8.1}$ $.9\overline{)6.3}$ $.9\overline{)5.4}$

From 2 take: 1.5, 1.6, 1.8, 1.2, 1.3, 1.7, 1.1, 1.4

Express as Arabic numbers: MCM, MCD, MDC, MDCC, MDCL

Mental 64

1. $(7 \div \frac{1}{11}) - 7$
2. $(9\frac{1}{11}\% \text{ of } 44) \times 3$
3. $4(9\frac{1}{11}\% \text{ of } 22)$
4. Express .4 as a per cent.
5. Express 80% as a fraction.
6. From 2 take 1.7 and multiply the result by 2.
7. $.9\overline{)5.4}$.
8. Another way of expressing $.37\frac{1}{2}$ as a decimal is ......(?)......
9. If $12\frac{1}{2}\%$ of 48 is 6, what is $37\frac{1}{2}\%$ of 48?
10. Write MDC in Arabic numbers.

Drill 65

Divide by $\frac{1}{12}$: 2, 8, 1, 6, 0, 5, 3, 9, 4, 7

$8\frac{1}{3}\%$ of: 36, 72, 48, 12, 60, 84, 24, 96, 108

Reduce: $\frac{12}{36}$, $\frac{12}{48}$, $\frac{12}{60}$, $\frac{12}{84}$, $\frac{12}{72}$, $\frac{12}{108}$, $\frac{48}{96}$, $\frac{36}{72}$

Express as decimals: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{3}{4}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{3}{10}$, $\frac{7}{10}$

Express as fractions: 50%, 25%, 75%, 30%, 20%, 40%, 80%, 60%

Express as per cents: $\frac{7}{10}$, $\frac{3}{10}$, $\frac{9}{10}$, $\frac{1}{10}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$

From 1 take: $\frac{9}{10}$, $\frac{3}{4}$, $\frac{8}{9}$, $\frac{1}{9}$, $\frac{7}{10}$, $\frac{4}{5}$, $\frac{6}{7}$, $\frac{1}{12}$

Express as Arabic numbers: MDC, MDCL, MDCLV, MDCLVI

Mental 65

1. $(8 \div \frac{1}{12}) \times \frac{1}{2}$
2. $3(8\frac{1}{3}\% \text{ of } 48)$
3. Reduce $\frac{120}{600}$ to lowest terms.
4. Express $\frac{2}{5}$ as a per cent.
5. From 1 take $\frac{5}{9}$ and multiply the result by 3.
6. If $8\frac{1}{3}\%$ of 36 is 3, what is $16\frac{2}{3}\%$ of 36?
7. Another way of expressing $.62\frac{1}{2}$ as a decimal is ......(?)......
8. What part of 1 gallon is 1 pint?
9. What per cent of 1 gallon is 1 quart?
10. Write MDCLV in Arabic numbers.

Drill 66

Reduce: $\frac{3}{12}$, $\frac{9}{27}$, $\frac{12}{36}$, $\frac{6}{18}$, $\frac{9}{30}$, $\frac{15}{30}$, $\frac{6}{36}$, $\frac{9}{24}$

Express as mixed numbers: $\frac{26}{3}$, $\frac{23}{3}$, $\frac{19}{3}$, $\frac{31}{3}$, $\frac{28}{3}$, $\frac{25}{3}$, $\frac{17}{3}$, $\frac{14}{3}$

Express as improper fractions: $3\frac{3}{5}$, $3\frac{4}{7}$, $3\frac{2}{9}$, $3\frac{1}{6}$, $3\frac{3}{4}$, $3\frac{3}{8}$, $3\frac{1}{3}$

Express as decimals: $8\frac{1}{3}\%$, $6\frac{2}{3}\%$, $6\frac{1}{4}\%$, $2\frac{1}{2}\%$, $1\frac{1}{2}\%$, $3\frac{1}{3}\%$

Express as per cents: .045, .025, .035, .015, .075, .055, .095, .085, .125, .375, .625, .875, .105, .205, $.09\frac{1}{2}$, $.08\frac{1}{2}$, $.05\frac{1}{2}$, $.01\frac{1}{2}$, $.07\frac{1}{2}$, $.02\frac{1}{2}$, $.03\frac{1}{2}$

Express as minutes: $\frac{1}{2}$ hr., $\frac{1}{3}$ hr., $\frac{1}{6}$ hr., $\frac{1}{12}$ hr., $\frac{1}{5}$ hr., $\frac{1}{20}$ hr., $\frac{1}{60}$ hr.

Mental 66

1. Reduce $\frac{90}{270}$ to lowest terms.
2. How much less than $3\frac{2}{9}$ is $\frac{28}{9}$?
3. Express $6\frac{2}{3}\%$ as a decimal.
4. Supply the next step: $6\frac{2}{3}\% = .06\frac{2}{3} = ?$
   $\frac{6\frac{2}{3}}{100} = \frac{20}{3} \div \frac{100}{1} = \frac{20}{3} \times \frac{?}{?}$
5. Jane practiced 1 hr. 40 min. Express this as hours.
6. .095 = ...(?)....%
7. $.05\frac{1}{2}$ = ...(?)....%
8. What is the net price, when lamps marked \$18, are reduced $16\frac{2}{3}\%$?
9. How many square feet are there in the area of a floor 12 ft. by 10 ft.?
10. Express 180 sq. ft. as square yards.

Drill 67

Reduce: $\frac{4}{16}$, $\frac{8}{24}$, $\frac{4}{48}$, $\frac{16}{32}$, $\frac{12}{24}$, $\frac{20}{40}$, $\frac{14}{28}$

$25\% = \frac{?}{4} = \frac{?}{16} = \frac{?}{32} = \frac{?}{20} = \frac{?}{36} = \frac{?}{24} = \frac{?}{12} = \frac{?}{48}$

$75\% = \frac{?}{4} = \frac{?}{16} = \frac{?}{32} = \frac{?}{48} = \frac{?}{20} = \frac{?}{36} = \frac{?}{24} = \frac{?}{12}$

Express as per cents: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{12}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{5}$, $\frac{1}{7}$, $\frac{1}{3}$, $\frac{1}{6}$

What fractional part of: 20 is 4, 28 is 4, 16 is 4, 24 is 4, 40 is 4, 12 is 4, 36 is 4, 32 is 4, 48 is 4, 8 is 4

What per cent of: 8 is 4, 12 is 4, 20 is 4, 16 is 4, 40 is 4, 48 is 4, 28 is 4, 32 is 4, 24 is 4, 36 is 4, 44 is 4

Mental 67

1. Express $\frac{1}{3}$ as a two place decimal.
2. Supply the next step:
   $3\frac{1}{3}\% = .03\frac{1}{3} = \frac{3\frac{1}{3}}{100} = \frac{10}{3} \div \frac{100}{1} = ?$
3. Supply the next step: $6\frac{1}{4}\% = .06\frac{1}{4} = \frac{6\frac{1}{4}}{100} = ?$
4. $\frac{1}{2}$ (25% of 40)
5. How many times 25% is 75%?
6. $.8\overline{)64}$
7. .06 × .04
8. Loss is 10%. Cost is \$60. Selling price is ....(?)....
9. How many square inches are there in 2 square feet?
10. What part of a square yard is a square foot?

Drill 68

Reduce: $\frac{5}{25}$, $\frac{15}{25}$, $\frac{20}{40}$, $\frac{25}{50}$, $\frac{10}{50}$, $\frac{20}{60}$, $\frac{25}{45}$, $\frac{30}{55}$

$20\% = \frac{?}{5} = \frac{?}{35} = \frac{?}{45} = \frac{?}{30} = \frac{?}{60} = \frac{?}{25} = \frac{?}{15}$

$40\% = \frac{?}{5} = \frac{?}{35} = \frac{?}{45} = \frac{?}{30} = \frac{?}{60} = \frac{?}{25} = \frac{?}{15}$

What fractional part of: 20 is 5, 30 is 5, 25 is 5, 15 is 5, 60 is 5, 10 is 5, 35 is 5, 45 is 5, 50 is 5, 40 is 5

Express as per cents: $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{7}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{12}$, $\frac{1}{2}$

What per cent of: 20 is 5, 30 is 5, 25 is 5, 15 is 5, 10 is 5, 35 is 5, 45 is 5, 50 is 5, 40 is 5

Mental 68

1. Change $\frac{3}{8}$ to a three-place decimal.
2. By what number would you multiply .09 to make 9 a whole number?
3. Multiply 16 by .625.
4. Divide \$5500 by 1000.
5. 50% of 1 mile = how many feet?
6. How many pints are there in 16 quarts?
7. Selling price is \$8; cost is \$10; what is the rate of loss?
8. Divide $5\frac{1}{2}$ by $2\frac{3}{4}$.
9. $87\frac{1}{2}\%$ is equal to ....(?).... (decimal)
10. $100\% - 12\frac{1}{2}\%$ = ...(?).... (fraction)

Drill 69

Reduce: $\frac{6}{18}$, $\frac{18}{24}$, $\frac{12}{48}$, $\frac{24}{30}$, $\frac{42}{48}$, $\frac{18}{36}$, $\frac{24}{54}$, $\frac{12}{60}$

$16\frac{2}{3}\% = \frac{?}{6} = \frac{?}{24} = \frac{?}{30} = \frac{?}{42} = \frac{?}{18} = \frac{?}{48} = \frac{?}{36} = \frac{?}{54} = \frac{?}{60}$

Reduce: $\frac{6}{30}$, $\frac{6}{18}$, $\frac{6}{36}$, $\frac{6}{12}$, $\frac{6}{42}$, $\frac{6}{54}$, $\frac{6}{48}$, $\frac{6}{60}$, $\frac{6}{72}$

What fractional part of: 24 is 6, 30 is 6, 18 is 6, 36 is 6, 60 is 6, 72 is 6, 12 is 6, 42 is 6?

Express as per cents: $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{2}$, $\frac{1}{7}$, $\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$

What per cent of: 12 is 6, 30 is 6, 42 is 6, 36 is 6, 24 is 6, 60 is 6, 48 is 6, 72 is 6, 54 is 6?

Mental 69

1. Express 50% of 1 bushel in pecks.
2. If the cost is $36 and the loss is $9, what is the rate of loss?
3. 2500 lb. = ...(?)...... cwt.
4. Add 10% of $.50 to 20% of $1.00.
5. If the amount sold is $4200 and the proceeds are $3900, what is the commission?
6. If the rate of discount is 15%, what is the rate of sale?
7. Find the perimeter of a field in yards if it is 90 ft. by 60 ft.
8. Selling price minus gain = ...(?)......
9. Selling price plus ......(?)...... = cost.
10. $11\frac{1}{9}\%$ = ...(?)...... (fraction)

Drill 70

Reduce: $\frac{7}{14}$, $\frac{7}{28}$, $\frac{7}{63}$, $\frac{7}{56}$, $\frac{7}{21}$, $\frac{7}{42}$, $\frac{7}{70}$, $\frac{7}{35}$, $\frac{7}{49}$, $\frac{7}{84}$

$14\frac{2}{7}\% = \frac{?}{7} = \frac{?}{35} = \frac{?}{49} = \frac{?}{14} = \frac{?}{42} = \frac{?}{28} = \frac{?}{56} = \frac{?}{70}$

What fractional part of: 28 is 7, 35 is 7, 56 is 7, 21 is 7, 77 is 7, 63 is 7, 84 is 7, 14 is 7, 42 is 7, 70 is 7, 49 is 7?

As per cents: $\frac{1}{7}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{3}$, $\frac{1}{8}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{10}$, $\frac{1}{9}$, $\frac{1}{12}$, $\frac{1}{11}$

What per cent of: 14 is 7, 70 is 7, 21 is 7, 28 is 7, 42 is 7, 77 is 7, 63 is 7, 35 is 7, 49 is 7?

From 1 take: $\frac{7}{8}$, $\frac{1}{9}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{1}{4}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{7}{8}$, $\frac{9}{10}$, $\frac{7}{10}$, $\frac{5}{12}$

Mental 70

1. What fractional part of $70 was left if $50 was spent?
2. Find $14\frac{2}{7}\%$ of $84 and subtract $2.
3. $\frac{1}{7}$ of 77 is what % of 55?
4. If the gain is $45 and the cost is $450, what is the rate of gain?
5. If the list price is $90 and the discount is $15, what is the rate of reduction?
6. How many times is $\frac{1}{2}$ contained in $2\frac{1}{2}$?
7. If $\frac{1}{2}$ lb. of steak costs $.50, what will $2\frac{1}{2}$ lb. cost?
8. If 20% of the cost of our new house is $3000, what is the entire cost of the house?
9. How many hours are there in 270 minutes?
10. From $1\frac{1}{2}$ take $\frac{3}{4}$.

Drill 71

$12\frac{1}{2}\% = \frac{?}{8} = \frac{?}{32} = \frac{?}{48} = \frac{?}{80} = \frac{?}{72} = \frac{?}{24} = \frac{?}{40} = \frac{?}{56} = \frac{?}{64}$

Reduce: $\frac{8}{40}$, $\frac{8}{16}$, $\frac{8}{72}$, $\frac{8}{56}$, $\frac{8}{24}$, $\frac{8}{80}$, $\frac{8}{32}$, $\frac{8}{48}$, $\frac{8}{96}$, $\frac{8}{64}$

What fractional part of: 32 is 8, 64 is 8, 40 is 8, 80 is 8, 96 is 8, 16 is 8, 48 is 8, 72 is 8?

Express as per cents: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{9}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{7}$, $\frac{1}{5}$, $\frac{1}{3}$, $\frac{1}{11}$

What per cent of: 28 is 7, 63 is 7, 14 is 7, 35 is 7, 42 is 7, 56 is 7, 84 is 7, 70 is 7, 49 is 7?

From 1 take: .2, .4, .9, .5, .7, .8, .3, .1, .6

Mental 71

1. Find the number of which 8 is $\frac{2}{5}$.
2. From 9.5 take 1.25.
3. Multiply 35.764 by 1000.
4. Divide 250 by 5 and take 10% of the quotient.
5. Which is greater and by how much, 20% of 60 or $\frac{2}{5}$ of 60?
6. If $\frac{1}{7}$ of a number is 9, what is $28\frac{4}{7}\%$ of that number?
7. Multiply 120 by 6 and take 50% of it.
8. Find the number of hours between 11 A.M. and 5 P.M. of the same day.
9. Which is greater 6.75 or 67.5?
10. If 17 years is 50% of John's age, what is his age?

Drill 72

Reduce: $\frac{9}{27}, \frac{9}{45}, \frac{9}{18}, \frac{9}{63}, \frac{9}{81}, \frac{9}{36}, \frac{9}{54}, \frac{9}{72}, \frac{9}{90}, \frac{9}{108}$

$11\frac{1}{9}\% = \frac{?}{9} = \frac{?}{36} = \frac{?}{54} = \frac{?}{18} = \frac{?}{63} = \frac{?}{27} = \frac{?}{45} = \frac{?}{72} = \frac{?}{81}$

What fractional part of: 36 is 9, 27 is 9, 45 is 9, 54 is 9, 90 is 9, 63 is 9, 81 is 9, 99 is 9, 18 is 9, 72 is 9, 108 is 9

Express as per cents: $\frac{1}{9}, \frac{1}{4}, \frac{1}{3}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{7}, \frac{1}{10}, \frac{1}{12}$

What per cent of: 63 is 9, 81 is 9, 90 is 9, 36 is 9, 27 is 9, 72 is 9, 45 is 9, 99 is 9, 54 is 9, 18 is 9, 108 is 9

$.9\overline{)18}$ $.09\overline{)18}$ $.9\overline{)27}$ $.09\overline{)27}$ $.09\overline{)36}$

Mental 72

1. How many sq. yards are there in a rectangle 8 ft. by 9 ft.?
2. What fractional part of $640 is $320?
3. What is 36 divided by .9?
4. If the loss was $7 and the selling price was $13.50, what was the cost?
5. $62\frac{1}{2}\%$ = what fraction?
6. At 3 for 20¢, how much will 9 cakes of soap cost?
7. Find the perimeter in yards of a field 9 ft. by 12 ft.
8. Which has the greater area, a square 6 feet on a side or a rectangle 5 feet by 6 feet?
9. As a fraction .375 = ……(?)……
10. $\frac{4}{25}$ = ……(?)……%.

Drill 73

$10\% = \frac{?}{10} = \frac{?}{40} = \frac{?}{20} = \frac{?}{50} = \frac{?}{30} = \frac{?}{70} = \frac{?}{60} = \frac{?}{90} = \frac{?}{80}$

Reduce: $\frac{10}{100}, \frac{40}{100}, \frac{60}{100}, \frac{90}{100}, \frac{70}{100}, \frac{30}{100}, \frac{20}{100},$

What fractional part of: 100 is 40, 100 is 30, 100 is 50, 100 is 10, 100 is 20, 100 is 80, 100 is 60, 100 is 90

Express as per cents: $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{1}{10}, \frac{7}{10}, \frac{3}{10}, \frac{9}{10}, \frac{1}{2}, \frac{1}{12}$

What per cent of: 100 is 20, 100 is 40, 100 is 60, 100 is 80, 100 is 50, 120 is 10, 100 is 10, 100 is 30, 100 is 70, 100 is 90, 60 is 10, 70 is 10, 80 is 10, 90 is 10, 40 is 10,

Mental 73

1. 3 times any number equals (?) % of it?
2. What is .25 of 120?
3. Reduce to lowest terms: $\frac{640}{1280}$.
4. Change $\frac{3}{25}$ to $\frac{?}{100}$.
5. 40% of 50 is what fractional part of 40?
6. If the cost is $15 and the selling price is $20, what is the gain %.
7. Divide $75 by 100.
8. Find 150% of a bushel in pecks.
9. What per cent of 1 dozen eggs is 18 eggs?
10. Write 1500 in Roman numerals.

Drill 74

$9\frac{1}{11}\% = \frac{?}{11} = \frac{?}{33} = \frac{?}{66} = \frac{?}{77} = \frac{?}{44} = \frac{?}{22} = \frac{?}{55} = \frac{?}{88} = \frac{?}{99}$

Reduce: $\frac{11}{22}, \frac{11}{66}, \frac{11}{44}, \frac{11}{88}, \frac{11}{55}, \frac{11}{99}, \frac{11}{77}, \frac{11}{33}$

What fractional part of 22 is 11, 44 is 11, 77 is 11, 88 is 11, 99 is 11, 33 is 11, 55 is 11, 66 is 11, 110 is 11, 11 is 1

Express as per cents: $\frac{1}{11}, \frac{1}{5}, \frac{1}{6}, \frac{1}{10}, \frac{1}{4}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{2}, \frac{1}{3}$

What per cent of 11 is 1, 22 is 11, 44 is 11, 55 is 11, 66 is 11, 99 is 11, 88 is 11, 33 is 11,

$\frac{5}{9}+\frac{4}{9}$ $\frac{2}{9}\div\frac{2}{9}$ $\frac{2}{9}\times 0$ $\frac{2}{9}\times\frac{2}{9}$ $\frac{2}{9}-\frac{2}{9}$

Mental 74

1. Write .364 after it has been multiplied by 1000.
2. The quotient is 3.46; the divisor is 100; what is the dividend?
3. How many $\$\frac{1}{4}$ are there in $\$2\frac{1}{2}$?
4. $\frac{9}{20}$ = ……(?)……%.
5. Give the decimal equivalent of $62\frac{1}{2}\%$.
6. Find the wrong number in the series: 27, 24, 21, 18, 14, 12, 9, 6, 3.
7. How many square rods are there in 25% of an acre?
8. How many seconds are there in 1 hour?
9. How many months older is John who was born on Jan. 1, 1945 than James who was born on August 1 of the same year?
10. Complete the series: 2, 6, 10, 14, 18, 22, ……(?)……

Drill 75

$8\frac{1}{3}\% = \frac{?}{12} = \frac{?}{60} = \frac{?}{84} = \frac{?}{24} = \frac{?}{72} = \frac{?}{96} = \frac{?}{48} = \frac{?}{108}$

Reduce: $\frac{12}{60}$, $\frac{12}{24}$, $\frac{12}{108}$, $\frac{12}{84}$, $\frac{12}{48}$, $\frac{12}{72}$, $\frac{12}{96}$, $\frac{12}{144}$, $\frac{12}{120}$

What fractional part of: 60 is 12, 84 is 12, 144 is 12, 120 is 12, 72 is 12, 24 is 12, 48 is 12, 36 is 12, 96 is 12, 12 is 1?

Express as per cents: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{11}$, $\frac{1}{12}$

What per cent of: 72 is 12, 48 is 12, 96 is 12, 24 is 12, 36 is 12, 12 is 1, 144 is 12, 120 is 12, 60 is 12 ?

Add .9 to: .3, .2, .1, .4, .6, .5, .9, .7, .8

Mental 75

1. How many $\frac{1}{4}$ lb. bags can be filled from 12 pounds of candy?
2. Reduce to lowest terms: $\frac{22000}{55000}$.
3. What fractional part of 44 is 11?
4. What % of 66 is 11?
5. If the cost is $80 and the rate of gain is 5%, what is the gain?
6. What % of 1 square yard is 3 square feet?
7. How many ounces are there in 125% of 1 lb.?
8. Divide 87564 by 100.
9. To find a factor when the product and one factor are given we must ……(?)……
10. Which is the wrong number in the series? 96, 84, 72, 60, 48, 34, 24, 12

Drill 76

How many cents in: $\frac{1}{2}$ dollar, $\frac{1}{4}$ dollar, $\frac{1}{10}$ dollar, $\frac{1}{5}$ dollar, $\frac{2}{5}$ dollar, $\frac{3}{5}$ dollar, $\frac{4}{5}$ dollar, $\frac{3}{4}$ dollar, $\frac{1}{25}$ dollar, $\frac{2}{25}$ dollar, $\frac{3}{25}$ dollar, $\frac{4}{25}$ dollar, $\frac{1}{20}$ dollar, $\frac{3}{20}$ dollar, $\frac{7}{20}$ dollar, $\frac{9}{20}$ dollar, $\frac{1}{50}$ dollar ?

How many inches in: $\frac{1}{2}$ ft., $\frac{1}{4}$ ft., $\frac{3}{4}$ ft., $\frac{1}{3}$ ft., $\frac{2}{3}$ ft., $\frac{1}{6}$ ft., $\frac{5}{6}$ ft.?

Express as part of foot: 6 in., 3 in., 2 in., 1 in., 4 in., 8 in., 9 in., 10 in.

Express as part of yard: 18 in., 12 in., 24 in., 9 in., 6 in., 4 in., 2 in., 3 in.

How many inches in: $\frac{1}{2}$ yd., $\frac{1}{4}$ yd., $\frac{1}{6}$ yd., $\frac{1}{3}$ yd., $\frac{1}{9}$ yd., $\frac{1}{12}$ yd., $\frac{1}{18}$ yd. ?

Mental 76

1. A man paid $\$\frac{3}{4}$ for an article and sold it for $.72. Did he gain or lose and how much?
2. $\frac{3}{25}$ of a dollar = what per cent of 12?
3. How many yards are there in 3 rods?
4. What is the cost of 18 inches of ribbon at $.50 a yard?
5. If the gain is $6 and the cost is $48, what is the rate of gain?
6. What per cent of $50 is $5?
7. If the divisor is .9 and the quotient is .2, what is the dividend?
8. If the product is $3.50 and one factor is $.70, what is the other factor?
9. Multiply 6.75 by 100.
10. Divide $75.60 by 10.

Drill 77

As part of 1 dollar: 50¢, 25¢, 75¢, 20¢, 40¢, 60¢, 80¢, 90¢, 10¢, 5¢, 4¢, 2¢, 1¢, 8¢

Days in: 1 wk., $\frac{1}{7}$ wk., $\frac{4}{7}$ wk., $\frac{5}{7}$ wk., $\frac{2}{7}$ wk., $\frac{6}{7}$ wk., $\frac{3}{7}$ wk.

As part of 1 lb.: 8 oz., 4 oz., 1 oz., 15 oz., 10 oz., 2 oz., 3 oz.

Ounces in: $\frac{1}{2}$ lb., $\frac{1}{16}$ lb., $\frac{1}{8}$ lb., $\frac{1}{4}$ lb., $\frac{3}{4}$ lb., $\frac{5}{8}$ lb., $\frac{3}{8}$ lb.

As part of 1 day: 6 hrs., 12 hrs., 4 hrs., 2 hrs., 8 hrs., 3 hrs., 1hr.

Hours in: $\frac{1}{2}$ da., $\frac{1}{8}$ da., $\frac{1}{3}$ da., $\frac{1}{12}$ da., $\frac{1}{6}$ da., $\frac{1}{4}$ da., $\frac{1}{24}$ da.

1 ton = ……(?)…… lb. 1 gross = ……(?)…… doz.

Mental 77

1. Which four coins make 16¢?
2. What per cent of 10 is 4?
3. What per cent is equal to $\frac{3}{50}$?
4. If the net price is $30, and the list price is $36, what is the rate of discount?
5. What per cent of 1 hour is 10 minutes?
6. What fractional part of a yard is 9 inches?
7. Change 2 rods to yards.
8. What decimal part of 20 is 10?
9. How many ounces are there in $1\frac{1}{2}$ lb.?
10. Which is greater $\$\frac{1}{2}$ million or $600,000?

Drill 78

Find cost of 1 doz. at: 2¢ each, 4¢ each, 9¢ each, 5¢ each, 10¢ each, 12¢ each, 8¢ each, 3¢ each, 6¢ each, 7¢ each

$\frac{1}{2}=\frac{?}{100}$ $\frac{1}{4}=\frac{?}{100}$ $\frac{3}{4}=\frac{?}{100}$ $\frac{1}{5}=\frac{?}{100}$ $\frac{1}{20}=\frac{?}{100}$

$\frac{3}{20}=\frac{?}{100}$ $\frac{1}{25}=\frac{?}{100}$ $\frac{3}{25}=\frac{?}{100}$ $\frac{1}{50}=\frac{?}{100}$

Express as fractions: .7, .07, .007, .3, .003, .03, .006, .1, .01, .001, .9, .019, .19, .21, .021, .043

.1 × .01 .2 × .02 .3 × .03 .4 × .02 .5 × .01

Add .8 to: .03, .05, .07, .09, .06, .02, .04, .08

Mental 78

1. When a dealer buys goods for $120 and sells at a gain of $16\frac{2}{3}\%$, what is the gain?
2. 25% of 1 gallon equals how many pints?
3. Divide 35.68 by 10.
4. Multiply 25% of 16 by 10% of 30.
5. What fractional part of 540 is 90?
6. If Mr. Cox lost 20 of his 180 pounds, what per cent of his weight did he lose?
7. If the commission is $30 and the amount sold is $240, what is the rate of com.?
8. Divide the product of 1.2 and 3 by 10.
9. Take 25% of $1000 from $500.
10. If the cost is $.25 and the loss is $.05, what is the rate of loss?

Drill 79

How many minutes from: 1:10 to 1:30, 1:50, 1:25, 1:45, 1:40, 1:55, 1:15, 2:00, 2:05, 2:10, 2:15?

How much less than 1 hr. is: 40 min., 20 min., 50 min., 10 min., 15 min., 25 min., 55 min.?

How many feet in: 1 yd., 1 yd. 1 ft., 1 yd. 2 ft., 2 yd., 2 yd. 1 ft., $1\frac{1}{3}$ yd., $2\frac{2}{3}$ yd., $1\frac{2}{3}$ yd., $2\frac{1}{3}$ yd., $3\frac{1}{3}$ yd., $3\frac{2}{3}$ yd., $4\frac{2}{3}$ yd., $5\frac{1}{3}$ yd.?

Add .07 to: .07, .09, .06, .08, .05, .04, .03
Take .7 from: 1.3, 1.4, 1.6, 1.2, 1.1, 1.7, 1.8

Mental 79

1. Which 4 coins make $.75?
2. 40 minutes = what per cent of 2 hours?
3. Which is longer and by how much—a rope 3 yards long or one that is 72 inches long?
4. Take 30% of the product of 6 × 5.
5. If the rate of gain is 9%, what is the rate of sale?
6. What per cent of a year is 8 months?
7. Potatoes bought for $4 per cwt. are sold for $5 per 100 lb. What is the gain %?
8. Which covers more area and by how much, a field 10 rods square or one whose area is $\frac{1}{2}$ acre?
9. What fractional part of 50 is 25% of 100?
10. Find the cost of 12 pencils at 3 for 5¢?

Drill 80

Rule for finding: Per. of rectangle, Per. of square, Area of rectangle

Missing term: (.?.) = l.p. × r. of dis.; (.?.) = cost × r. of gain; (.?.) = cost × r. of loss; s.p. = cost × (.?.); com. = am't. sold × (.?.)

Factor or product? list price, discount, cost, r. of dis., selling price.

$8\frac{1}{3}\%$ of: 12, 36, 24, 60, 48, 84, 72, 108, 96, 120

Express as per cents: $\frac{1}{100}$, $\frac{3}{100}$, $\frac{7}{100}$, $\frac{9}{100}$, $\frac{21}{100}$, $\frac{29}{100}$, $\frac{61}{100}$, $\frac{13}{100}$

What per cent of 10 is 7, 10 is 9, 10 is 1

Mental 80

1. .....?..... of a rectangle equals 21 + 2w.
2. .....?..... of a square equals 4s.
3. .....?..... of a rectangle equals 1 × w.
4. .....?..... = list price × rate of discount.
5. .....?..... = cost × rate of gain.
6. .....?..... = cost × rate of loss.
7. .....?..... = am't sold × rate of commission.
8. .....?..... = cost × rate of selling price.
9. .....?..... = am't. bought × rate of commission.
10. .....?..... = Selling price—cost.

Drill 81

$12\frac{1}{2}\%$ of: 1.6, 3.2, 5.6 7.2, 9.6, 4.8, 6.4, .8

$11\frac{1}{9}\%$ of: 2.7, 4.5, .9, 3.6, 1.8, 6.3, 8.1, 7.2

$16\frac{2}{3}\%$ of: 2.4, 1.8, 4.2, 1.2, .6, 4.8, 3.6, 5.4

$14\frac{2}{7}\%$ of: 4.2, 2.8, 2.1, 3.5, 5.6, 1.4, 6.3, 4.9

20% of: .25, .45, .35, .55, .15, .05, .65, .75

25% of: .8, .04, 3.2, .16, 3.6, .24, .48, 1.2

$33\frac{1}{3}\%$ of: .006, .012, .018, .009, .027, .024, .021, .036

Express as Arabic nos.: LXVI, CLXX, CDV, DLVII, MLXXX, MCMLX

Mental 81

1. Which is greater, $33\frac{1}{3}\%$ or $\frac{1}{6}$?
2. Find 75% of 1 short ton.
3. 25% of $40 is what fractional part of $100?
4. If the commission is $48 and the amount bought is $960, what is the rate of commission?
5. Find the cost of 10 boxes of candy at $2.50 a box.
6. What per cent of an hour is 90 minutes?
7. Take $16\frac{2}{3}\%$ of 24 from 36.
8. Which is greater and by how much, $\frac{1}{4}$ of 40, or 20% of 40?
9. How many $\$\frac{1}{4}$ are there in $2.50?
10. Multiply $37\frac{1}{2}$¢ by 32.

Drill 82

Factor or product: rate per cent, base, percentage, distance, time, rate of speed, area, length, width, amount sold, amount bought, selling price, rate of discount, discount.

Missing term: net price = m.p. × (?);
proceeds = (?) × r. of proceeds;
(?) = cost × r. of selling price
(?) = l × w, (?) = 2l + 2w, d = m.p.h. × (?)

Express as Roman Numerals: 100, 500, 900, 1000, 2000

Mental 82

1. If $\frac{3}{4}$ of a yard of cloth cost $.75, what would $1\frac{1}{2}$ yards cost?
2. If one factor is 60 and the other is 90%, what is the product?
3. An agent sold goods for $3600 and sent back to his employer $3450. What was the agent's commission?
4. If books cost $87\frac{1}{2}$¢ apiece, how much will 80 books cost?
5. Find the perimeter of a square 22 ft. on a side.
6. Find the perimeter of a rectangle that is 20 ft. long and 30 ft. wide.
7. Which indicates more, 5 yards or 1 rod?
8. 30% of 1 hour equals how many minutes?
9. Which is the earlier date, MCM or MDC?
10. Multiply $35.35 by 100.

Drill 83

In the number: 1,624,590,783
8 = 8 (?) 9 = 9 (?) 7 = 7 (?)
5 = 5 (?) 4 = 4 (?) 3 = 3 (?)
0 = 0 (?) 1 = 1 (?) 6 = 6 (?)

Nickels in: $1.00, $.75, $.50, $.60, $.80, $.90, $.40, $.55, $.45, $.35, $1.05, $1.10, $1.20

Roman Numerals: 1000, 1900, 1950, 1965, 2000, 1400, 1492, 1920, 1935, 2050, 1643

Mental 83

1. How many $\$\frac{1}{2}$ are contained in $5.00?
2. Find the cost of 240 copy books $8\frac{1}{3}$¢ each.
3. Find the discount on a clock marked $10.50 if the rate of discount is 10%.
4. The amount bought is $300; the rate of commission is 2%; what is the commission?
5. What fractional part of $540 is $90?
6. How many pecks are there in $8\frac{1}{2}$ bushels?
7. What per cent of a year is 4 months?
8. Multiply 30 by 25% of 40.
9. How many dimes are there in $40?
10. How many pounds are there in 320 ounces?

Tables of Measure

Long Measure

Used in measuring lines.

12 inches = **1** foot
3 feet = **1** yard
36 inches = **1** yard
5½ yards = **1** rod
16½ feet = **1** rod
320 rods = **1** mile
1760 yards = **1** mile
5280 feet = **1** mile

in.
ft.
yd.
rd.
mi.

Square Measure

Used in measuring surfaces.

144 square inches = **1** square foot
9 square feet = **1** square yard
30¼ square yards = **1** square rod
160 square rods = **1** acre

Measures of Weight

16 ounces = **1** pound
100 pounds = **1** cwt.
20 cwt. = **1** ton
2000 pounds = **1** ton (short)
2240 pounds = **1** ton (long)

oz.
lb.
cwt.
T.

Measures of Counting

12 things = **1** dozen
12 dozen = **1** gross
144 things = **1** gross

doz.
gr.

Liquid Measure

2 cupfuls = **1** pint
2 pints = **1** quart
4 quarts = **1** gallon

pt.
qt.
gal.

Dry Measure

2 pints = **1** quart
8 quarts = **1** peck
4 pecks = **1** bushel

qt.
pk.
bu.

Measures of Time

60 seconds = **1** minute
60 minutes = **1** hour
24 hours = **1** day
7 days = **1** week
52 weeks = **1** year
12 months = **1** year
365 days = **1** year
366 days = **1** leap year
10 years = **1** decade
100 years = **1** century

sec.
min.
hr.
da.
wk.
mo.
yr.

Thirty days have September,
April, June and November.
All the rest have thirty-one,
Except February which has **28** and no more,
'Til leap year comes, then it has one more.

A leap year is one that is exactly divisible by **4**, as **1952**.

United States Money

5 cents = **1** nickel
2 nickels = **1** dime
10 cents = **1** dime
10 dimes = **1** dollar
25 cents = **1** quarter
50 cents = **1** half-dollar
100 cents = **1** dollar

PROGRESS *in Arithmetic* 8

SADLIER

903